



**Graduate Study Program**

**School of Public Health**

**Determinants of Developmental Delay Among Under-Three Years  
Children in Addis Ababa, Ethiopia 2025.**

**Investigator: Biniyam Leul (BSc, Public Health)**

**A Research Thesis Submitted to the School of Public Health of St. Paul's Hospital  
Millennium Medical College in Partial Fulfillment of the Requirements for the Degree  
of Master of Public Health in Epidemiology.**

**October 2025**

**Addis Ababa, Ethiopia**

**St. Paul's Hospital Millennium Medical College**  
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**Advisor(s): Zewdie Aderaw (PhD, Associate Professor of PH)**

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## ABBREVIATIONS AND ACRONYMS

|        |                                                                        |
|--------|------------------------------------------------------------------------|
| AA     | - Addis Ababa                                                          |
| AACAHB | - Addis Ababa city Administration Health Bureau                        |
| ADHD   | - Attention-Deficit/Hyperactivity Disorder                             |
| AOR    | - Adjusted Odd Ratio                                                   |
| ASD    | - Autism Spectrum Disease                                              |
| ASQ    | - Age Specific Questionnaire                                           |
| CI     | - Confidence Interval                                                  |
| CMV    | - Cytomegalovirus                                                      |
| DD     | - Developmental Delay                                                  |
| ECD    | - Early Childhood Development                                          |
| ECDEPS | - Early Childhood Development and Education Policy Strategic Framework |
| ECD-PC | - Early Childhood Development Parental Coaching                        |
| EMDHS  | - Ethiopia Mini Demographic and Health Survey                          |
| ESS    | - Ethiopian Statistical Service                                        |
| FASD   | - Fetal Alcoholic Spectrum Disorder                                    |
| FMOH   | - Federal Ministry of Health                                           |
| HSTP   | - Health Sector Transformation Plan                                    |
| IRB    | - Institutional Review Board                                           |
| LMIC   | - Low- and Middle-Income Countries                                     |
| LBW    | -Low Birth Weight                                                      |
| MOE    | - Ministry of Education                                                |
| MOH    | - Ministry of Health                                                   |
| SES    | - Socio-Economic Status                                                |
| SPHMMC | - Santa Paul's Hospital Millennium Medical College                     |
| TVET   | - Technical and Vocational Education and Training                      |
| USA    | -United States of America                                              |
| UNICEF | - United Nations Children's Fund                                       |
| WB     | - World Bank                                                           |

WHO- World Health Organization

## ABSTRACT

**Background:** Developmental delays among children under three years of age are a significant public health issue, particularly in low- and middle-income countries like Ethiopia. The prevalence of these delays is alarmingly high, with estimates suggesting that over 30% of children in Ethiopia exhibits delay due to factors such as malnutrition, inadequate healthcare access, and socioeconomic disparities.

**Objectives:** This study aims to assess determinants of developmental delay among under three years children in Addis Ababa, Ethiopia, 2025.

**Methods and Materials:** A community-based unmatched case-control study was conducted in Addis Ababa, targeting children under three years of age, with a sample size of 589, with 295 cases and 294 controls, determined through clustered random sampling to ensure diverse socio-demographic representation. Caregivers were provided informed consent, and data was collected via structured questionnaires and home visits conducted by trained enumerators. Quality control measures were included training, pre-testing of instruments, and supervision, along with ethical approval to protect confidentiality. The data were entered into EpiData 4.6.0 and exported to SPSS 25 for analysis. The analysis began with descriptive statistics for categorical and continuous variables. A bivariate binary logistic regression were identified associations between independent and dependent variables, retaining those with  $p < 0.25$  for multivariable binary logistic regression analysis. The final model was quantified using Adjusted Odds Ratios (AOR) with 95% confidence intervals (CI) and a significance threshold of  $p < 0.05$ . Multi-collinearity was checked among predictors and the Hosmer–Lemeshow test was performed to assess model fit..

**Results:** Multiple factors were independently associated with developmental delay. Key risk factors included maternal illiteracy (AOR = 6.45, 95% CI: 3.44–12.07), late initiation of complementary feeding (AOR = 2.03, 95% CI: 1.12–3.68), maternal infections during pregnancy (AOR = 2.22, 95% CI: 1.30–3.79), low birth weight (AOR = 2.35, 95% CI: 1.44–3.83), and nutritional deficiencies (AOR = 2.00, 95% CI: 1.27–3.15). Protective factors included larger family size (AOR = 0.51, 95% CI: 0.28–0.92), availability of local early childhood resources (AOR = 0.60, 95% CI: 0.40–0.89), and access to trained healthcare professionals (AOR = 0.57, 95% CI: 0.34–0.95).

**Conclusion:** Developmental delay among under-three children in Addis Ababa is determined by a complex interplay of factors. Interventions should be multi-sectorial, focusing on improving maternal education, enhancing prenatal and postnatal care, promoting optimal infant feeding practices, and strengthening community-based early childhood development programs and healthcare services.

**Key Words:** Developmental delays, early childhood development, socio-demographic factors, maternal health

## 1. Introduction

### 1.1. Background

The first 1,000 days of life, from conception to the second birthday, constitute a period of unparalleled brain growth and foundational development that sets the trajectory for lifelong health, learning, and behavior (1). Developmental Delay (DD) is defined as a significant lag in one or more domains of development—gross motor, fine motor, speech-language, cognitive, and personal-social—compared to chronological age expectations (2). Globally, it is estimated that over 250 million children under five are at risk of not reaching their developmental potential, with the vast majority residing in low- and middle-income countries (LMICs) (3). In Ethiopia, the burden is substantial, exacerbated by pervasive poverty, malnutrition, and limited access to early stimulation. The 2019 Ethiopia Mini Demographic and Health Survey (EMDHS) indicated that only about 44% of children aged 36-59 months are developmentally on track (4). Community-based studies from various regions report prevalence rates of suspected DD ranging from 22% to 39% among under-five children (5, 6). The capital, Addis Ababa, presents a unique context of rapid urbanization and significant socioeconomic disparities, which may influence distinct developmental risk profiles compared to rural settings (7).

Understanding the determinants of DD requires a multifactorial lens, best explained by a bio psychosocial ecological framework (8). This model posits that child development is shaped by the continuous interaction of factors at multiple levels. At the core are biological and child-level factors such as prematurity, low birth weight (LBW), perinatal complications, and acute or chronic illnesses like severe acute malnutrition, which directly affect brain structure and function (9). Surrounding this core are proximal factors in the immediate home environment, including the quality of caregiver-child interactions, availability of learning materials and play opportunities, parental (particularly maternal) mental health, and caregiver knowledge of child development (10,11). The distal ecosystem encompasses broader socioeconomic and contextual determinants, including household food insecurity, poverty, parental education, lack of access to early childhood development (ECD) services, and environmental safety (12,13). This framework

underscores that determinants are rarely isolated; they interact cumulatively, with risks compounding each other and protective factors potentially mitigating adverse effects.

Robust evidence identifies prematurity and LBW as paramount biological risks. A systematic review by Sacchi in 2020 reaffirmed that preterm and LBW infants are at a 2- to 4-fold increased risk of DD across all domains, with risks inversely proportional to gestational age and birth weight (14). In Ethiopia, malnutrition, specifically chronic under nutrition (stunting), has devastating and often irreversible effects on development. Stunting is not merely a marker of physical growth failure but of constrained brain development. A 2021 longitudinal study in sub-Saharan Africa demonstrated that children stunted at age 2 had significantly lower cognitive and language scores at age 6-8 years, even after controlling for socioeconomic status (15). The home learning environment is arguably the most modifiable determinant. A lack of age-appropriate play materials, limited variety of stimulating activities, and infrequent responsive interactions are strongly associated with poorer developmental outcomes (16). Maternal depression, a prevalent but often neglected condition in LMICs, severely compromises a mother's capacity for sensitive and responsive caregiving. A meta-analysis by Jeong estimated that children of mothers with depressive symptoms have a 41% higher risk of DD (17). Furthermore, lower maternal education consistently predicts poorer child development outcomes, primarily by affecting health-seeking behaviors, nutritional practices, and the quality of the home learning environment (18).

Recognizing these challenges, the Government of Ethiopia has prioritized ECD. Collaborative efforts among the Ministry of Education, Ministry of Health, and Ministry of Women and Social Affairs led to the integrated national Early Childhood Development and Education Policy and Strategic Framework (ECDEPS) (19). Furthermore, the Health Sector Transformation Plan II (HSTP II) underscores the commitment to improving child health outcomes (20). In Addis Ababa, a key initiative is the training and deployment of 5,000 Early Childhood Development Parental Coaching (ECD-PC) workers, who integrate developmental guidance into community health services (19). However, the effectiveness of such targeted interventions hinges on a precise, context-specific

understanding of local risk factors and their relative importance.

## 1.2. Statement of the problem

Despite the known global and national burden, developmental delays among children under three years in Addis Ababa represent a severe but largely unaddressed public health crisis. Research specific to the city indicates that approximately 30% of children in this age group exhibit developmental delays (21). This high prevalence is alarming given the critical window for intervention during the first three years of life. A profound service delivery gap exacerbates this problem. The Ethiopian healthcare system, through the Health Extension Program and the Integrated Management of Newborn and Childhood Illness, predominantly focuses on survival indicators such as immunization and nutritional status (20, 22). Routine, systematic developmental surveillance and screening for children under three are absent from the core package of primary health services. Consequently, DD in infants and toddlers remains largely unrecognized and undiagnosed until manifestations become severe at school age, missing the optimal window for effective, cost-efficient intervention (23, 24).

This service gap is compounded by a critical evidence gap. While the general risk factors for poor child development are documented, there is a severe lack of nuanced, context-specific evidence on the precise determinants affecting the under-three population in an urban African setting like Addis Ababa (5). Most research in Ethiopia has been conducted in rural agrarian communities or aggregates children under five, failing to isolate the unique exposures of the critical under-three period in a complex urban environment (5, 6, 25). The unique risk profiles stemming from urban poverty, informal settlements, maternal employment in the informal sector, environmental pollutants, and psychosocial stress are under-researched in the Ethiopian developmental literature (26,27). Furthermore, existing local research is predominantly descriptive (cross-sectional), establishing associations but with limited ability to explore the strength and hierarchy of multiple, interacting risk factors (28). To move from description to actionable public

health strategy, analytical epidemiological research that can identify key drivers is urgently needed. A community-based case-control study is specifically suited to fill this methodological gap, allowing for an efficient and robust investigation of determinants by comparing children with DD to typically developing peers from the same communities (29).

The consequences of inaction are severe. For the child, undetected DD leads to poor school readiness, academic failure, and limited economic potential (12). For the family, it results in emotional distress, social stigma, and catastrophic healthcare costs. For the city and nation, the cumulative effect is a loss of human capital and increased long-term dependency, undermining national development goals including the Sustainable Development Goals (SDG 4.2) (30). Therefore, this study is designed to address these interconnected gaps. This community-based unmatched case-control study aims to identify the key determinants of developmental delay specifically among under-three children in Addis Ababa. The findings will provide the context-specific, analytical evidence required to inform, refine, and strengthen early childhood development policies and programs, such as the ECD-PC worker initiative, ensuring they are effectively targeted to mitigate the most salient risks in this vulnerable urban population.

### 1.3. Significance of the study

The result of the study will address a significant public health issue with implications for child development in Ethiopia. By identifying and analyzing developmental delays, the research contributes to understanding early childhood development as a critical concern, which can lead to long-term consequences such as poor academic performance and increased health risks. Focusing on this topic enables a better understanding of the distinct socio-economic and cultural influences affecting child development in urban Ethiopia. This research also contributes to the existing literature on child development in Ethiopia, serving as a reference for future studies. It encourages further exploration of developmental issues and their associated factors, ultimately enriching the academic discourse in this field.

Furthermore, the study highlights the importance of early detection and intervention in addressing developmental delays. By raising awareness among healthcare providers and caregivers, it promotes practices that enhance child development through early screening and support. This study lies in its potential to influence public health practices, inform policy decisions, and ultimately improve developmental outcomes for children in Addis Ababa City and beyond. Finally, the study will provide a foundation for future research. By establishing baseline data on developmental delays and their determinants, future researchers can track changes over time and assess the impact of interventions. This perspective is crucial for understanding the long-term effects of early developmental challenges and for shaping effective policies and programs.

## 2. Literature review

### 2.1. Overview of developmental delay in children

Research indicates that the prevalence of developmental delays varies widely across different regions, with significant implications for early detection and intervention. A study conducted in Saudi Arabia reported a prevalence of 16.4% among preschool children, highlighting communication and problem-solving skills as the most affected areas (31). Similarly, a study in Nepal emphasized the role of socioeconomic factors in contributing to developmental delays, underscoring the need for timely detection and appropriate interventions (32).

The prevalence of developmental delays is particularly pronounced in low- and middle-income countries (LMICs), where rates significantly exceed those found in high-income nations. A systematic review and meta-analysis found a pooled prevalence of confirmed developmental delay of 18.83% among children in LMICs, with even higher rates observed in Africa, reaching 26.69% (33). This disparity underscores the urgent need for targeted strategies to address developmental issues in these regions.

In Ethiopia, studies have documented similarly high rates of developmental delays across various regions, particularly among children under five years old. Reports indicate prevalence rates as high as 28.13% in urban Ethiopian settings (34). For instance, a study conducted in Dessie city found that 16.31% of under-five children attending public health facilities exhibited gross motor developmental delays (35). This finding aligns with another study that reported a 28.13% rate of global developmental delays among infants and young children in Addis Ababa. Additionally, research in urban settings of Ethiopia indicated a prevalence rate of 20% for developmental delays (25). Notably, a study conducted in Southwest Ethiopia reported that approximately 29.4% of children aged 12–59 months exhibited developmental delays, with higher rates observed among those experiencing malnutrition (36).

The urgency of addressing developmental delays is further underscored by research showing that nearly 43% of children in various low-income settings are affected (37). A systematic review by Melaku highlighted that these delays are often under reported due to a lack of awareness and inadequate screening tools. The review noted that urban children may face unique challenges related to urbanization, such as exposure to environmental toxins and reduced outdoor play, which can hinder their developmental progress (38).

Taken together, these findings underscore the critical need for enhanced awareness, better screening tools, and targeted interventions to mitigate developmental delays, particularly in LMICs and urban settings. Addressing these challenges is essential for ensuring healthier developmental trajectories for children across diverse contexts.

## 2.2. Associated factors of developmental delay in children

### *Socio-demographic factors*

Developmental delays are particularly significant in younger children, especially those under the age of two, as this age range is crucial for both cognitive and physical development, rendering these children more susceptible to experiencing delays (39). Sex differences also play a role in developmental trajectories; a study conducted in Canada found that boys are more likely than girls to experience developmental delays (31). This suggests that biological and environmental factors may contribute to these disparities, necessitating gender-sensitive approaches in developmental assessments.

Birth order has been linked to developmental outcomes, with first-born children often exhibiting different developmental patterns compared to their younger siblings. An Australian study indicated that first-born children tend to have better cognitive skills, possibly due to increased parental attention and resources. Conversely, later-born children may face competition for parental resources, which can lead to developmental delays (40). In Ethiopia, a case-control study found that birth order significantly affects

developmental outcomes, with later-born children showing higher risks for delays (41). This highlights the need for targeted interventions that consider family dynamics and birth order in the Ethiopian context.

Research conducted in Ethiopia indicated that families with multiple young children often struggle to provide adequate developmental support due to resource constraints, finding a direct correlation between the number of under-three children and the likelihood of developmental delays (21). In urban settings like Addis Ababa, where family sizes may be larger, addressing the needs of multiple young children is essential for improving developmental outcomes. Interventions aimed at supporting families with several young children are crucial for mitigating developmental delays.

Family size, often linked to socioeconomic status, influences developmental outcomes. A study conducted in Brazil found that larger families tend to have lower per capita resources, negatively affecting children's development (42). In Ethiopia, cross-sectional research demonstrates that larger family sizes are associated with increased developmental delays among children under three (43). Family income also plays a critical role; higher family income is generally associated with better access to resources, including healthcare, nutrition, and educational opportunities. A case-control study in Ethiopia found that families with lower monthly incomes faced significant barriers to accessing quality healthcare and education, leading to increased developmental delays in their children (44).

The residential context of a family—whether urban or rural—significantly affects child development. Urban areas typically have better access to healthcare and educational services but may present unique challenges, such as overcrowding and pollution. A study conducted in multiple countries found that children living in urban settings had different developmental outcomes compared to those in rural areas, facing specific risks related to environmental factors (19). In Ethiopia, research indicates that urban residence is associated with increased developmental risks due to socioeconomic disparities and environmental stressors (45).

The age of mothers or caregivers is another significant predictor of child development. Younger mothers may lack the experience and resources necessary for optimal child-rearing, while older mothers generally have more stability and resources. A case-control study found that children of younger mothers were at a higher risk for developmental delays (39). In Ethiopia, the rising average age of mothers at childbirth has implications for child development, highlighting the need for targeted support for young mothers (46).

The educational status and occupation of mothers and caregivers significantly impact child development. Higher education levels are generally associated with better health and developmental outcomes for children, as mothers with higher educational attainment are more likely to engage in stimulating activities with their children (47). Conversely, lower educational levels and unstable occupations can limit caregivers' ability to provide optimal care. Research indicates that mothers with lower education levels faced difficulties in accessing healthcare and educational resources for their children, increasing the likelihood of developmental delays (48). Therefore, improving maternal education is essential for enhancing child developmental outcomes, emphasizing the need for education and training programs (43).

Fathers also play a crucial role in child development, with their education and occupation influencing developmental outcomes. A study in Brazil found that fathers with higher educational levels were more likely to be involved in their children's lives, providing emotional and financial support that positively impacts development. In Ethiopia, research indicates that paternal involvement is linked to better developmental outcomes, particularly in families where fathers have higher education levels (41). Engaging fathers in parenting programs and initiatives aimed at improving child development is vital.

### ***Maternal, neonatal and child health Factors***

Hereditary factors are pivotal in determining child development, as genetic predispositions can influence the likelihood of developmental disorders. A case-control study in the United States identified that children with a family history of developmental disorders, such as autism spectrum disorders (ASD) and attention-deficit/hyperactivity disorder (ADHD), are at increased risk for similar conditions (31). In Ethiopia, genetic factors contribute significantly to developmental disorders, emphasizing the need for genetic counseling and awareness programs in communities (41).

Maternal substance abuse during pregnancy has been extensively studied for its adverse effects on child development. Alcohol and drug use can lead to fetal alcohol spectrum disorders (FASD) and other developmental issues. A systematic review highlighted that maternal alcohol consumption during pregnancy is associated with cognitive deficits and behavioral problems in children (39). In Ethiopia, the prevalence of substance abuse among pregnant women is a growing concern, with studies indicating that maternal smoking and alcohol consumption are significant risk factors for developmental delays (32).

Poor maternal healthcare during pregnancy and childbirth can lead to adverse outcomes for both mothers and children. Studies have shown that inadequate prenatal care is associated with higher rates of developmental delays in children (49). Infections during pregnancy can also have detrimental effects on fetal development. Conditions such as cytomegalovirus (CMV), rubella, and syphilis are known to cause developmental delays. A case-control study found that maternal infections are linked to a higher incidence of cognitive and physical developmental delays in children (50). In Ethiopia, limited access to prenatal care can increase the risk of infections, with research demonstrating that maternal infections during pregnancy significantly correlate with developmental delays in children under three (51).

Premature birth and low birth weight (LBW) are well-documented risk factors for developmental delays. Infants born before 37 weeks of gestation often face health challenges that can affect their development. A meta-analysis reported that premature infants have a higher likelihood of developmental delays, particularly in cognitive and motor skills (52). In Addis Ababa, the prevalence of preterm births is concerning, correlating with increased developmental delays in children (53). Similarly, LBW is associated with various health issues, including developmental delays; research in Ethiopia identified a strong correlation between low birth weight and developmental delays in children under three (54).

Neurological conditions, such as cerebral palsy and autism spectrum disorders, are significant contributors to developmental delays. These conditions often have complex etiologies, including genetic and environmental factors. A case-control study in Ethiopia found that children diagnosed with cerebral palsy exhibit substantial delays in motor and cognitive development (55). Awareness and resources for managing these neurological conditions are limited, emphasizing the need for specialized healthcare services to support affected families (48).

Deficiencies in essential nutrients during pregnancy and early childhood can lead to developmental delays. Micronutrient deficiencies, particularly in iron, iodine, and folic acid, have been linked to cognitive impairments. Food insecurity and malnutrition are critical factors influencing early childhood development, with children experiencing chronic malnutrition being more likely to show developmental delays (50).

A systematic review found that children with nutritional deficiencies are at greater risk of experiencing developmental delays (56). In Ethiopia, malnutrition remains a pressing issue, with studies indicating the prevalence of micronutrient deficiencies among pregnant women and children, directly affecting developmental outcomes (47).

### ***Healthcare access and parent care giving practice factors***

Access to healthcare is a crucial determinant of developmental delay among children under three years in Addis Ababa, Ethiopia. Factors such as the availability of healthcare facilities, presence of trained professionals, economic barriers, transportation issues, and parental awareness significantly influence families' ability to seek timely and effective care. A case-control study demonstrated that regions with a higher density of healthcare facilities reported better developmental outcomes (57). However, the distribution of these facilities is uneven, often leaving families in remote areas without timely access to essential services.

The presence of trained healthcare professionals significantly influences early childhood development. Research has emphasized the importance of having pediatricians and child psychologists to provide early diagnosis and intervention for developmental issues (53). Economic factors, particularly the cost of healthcare services, pose significant barriers for many families, as high out-of-pocket expenses discourage parents from seeking timely medical attention for their children (58). Transportation infrastructure also affects healthcare access; inadequate public transportation options hinder families from reaching healthcare facilities (38).

Parental awareness of the importance of early healthcare is crucial in preventing developmental delays. Community education programs aimed at raising awareness about child development have been shown to improve healthcare-seeking behavior among families (59). Parental engagement and interaction also play a crucial role in child development, with studies showing that active parental involvement enhances cognitive and emotional development in children (60). Conversely, misconceptions surrounding medical interventions can deter families from seeking necessary care, highlighting the need for targeted educational initiatives. Long waiting times and overcrowding in healthcare facilities further hinder access to timely care, often leading families to abandon healthcare visits (25).

Inadequate breastfeeding practices contribute to malnutrition and developmental delays. Research carried out in urban Ethiopia demonstrated that children who were not exclusively breastfed had lower developmental scores compared to those who were (55). Promoting breastfeeding through community health initiatives is vital for improving child health in the region

Addressing these barriers through policy changes, community education, and improved healthcare infrastructure is essential for enhancing child development outcomes. By ensuring that families have access to necessary resources and support, Ethiopia can work towards reducing developmental delays and fostering healthier futures for its children.

### **Environmental Factors**

The quality of the home environment represents one of the most potent modifiable influences on early development. Physical aspects including adequate space, ventilation, lighting, and safety directly affect health and opportunities for exploration (61). Home environments rich in developmentally appropriate materials—such as books, puzzles, building blocks, and art supplies—facilitate the cognitively stimulating interactions essential for brain development (62). Exposure to environmental toxins within the home, including lead, indoor air pollution from cooking fuels, and pesticide residues, represents significant neurodevelopmental risks particularly in low-income urban settings (63).

Beyond the household, neighborhood characteristics significantly influence developmental opportunities. Access to safe, accessible outdoor play spaces supports physical development, risk assessment skills, and social interaction (64). In dense urban environments, the availability of parks, playgrounds, and pedestrian-friendly spaces represents a critical equity issue affecting developmental outcomes. Community resources such as libraries, early childhood centers, parent-child programs, and community events provide enriched learning environments and social support networks (65).

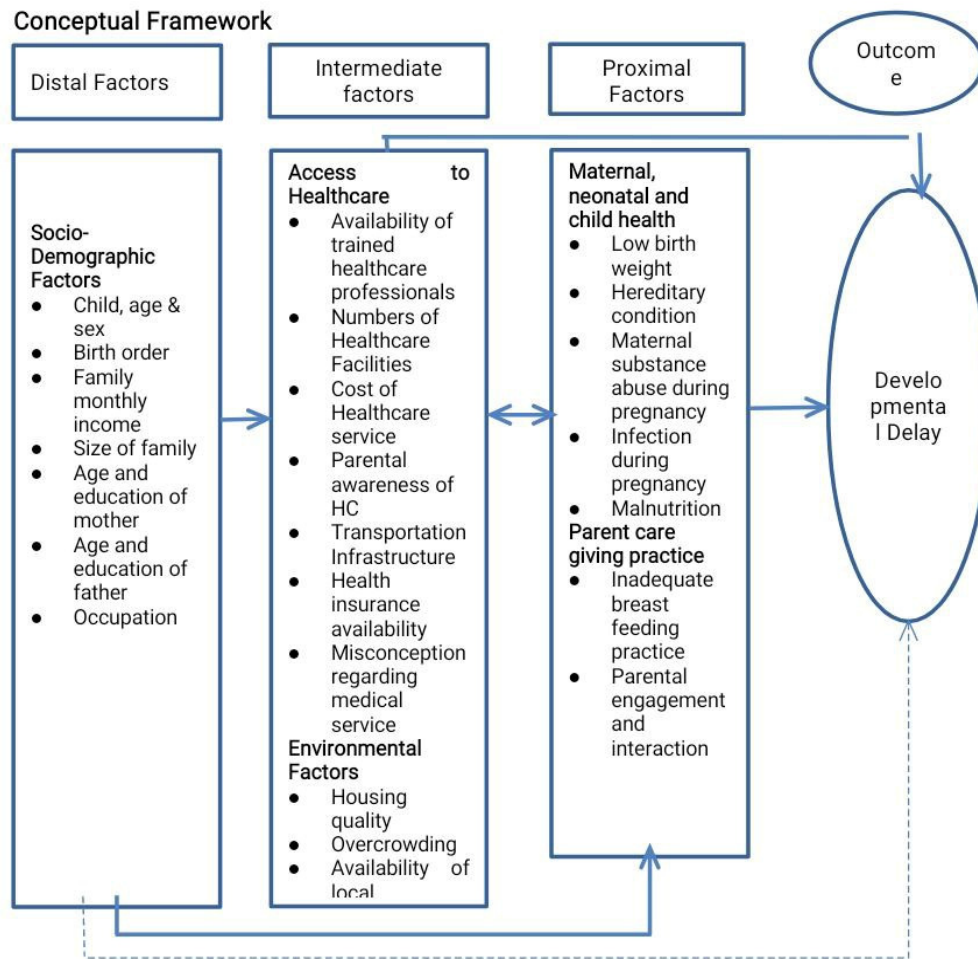


Fig 1: Diagram Represents the Conceptual Framework of Determinants of Developmental Delay Among Under-three Years Children; Developed by Principal Investigator by Reviewing Different Studies (7-10, 14-16, 21, 31, 42, 51, 54-58)

Key: — Shows direct relationship  
- - - Shows indirect relationship

This conceptual framework illustrates that the determinants of developmental delay among children under three operate through interconnected levels of influence, forming a cascade from distal to proximal factors. Distal socio-demographic factors—such as parental education, family income, and household size—exert an indirect influence on developmental outcomes by shaping the family's access to resources and opportunities. These factors, in turn, affect intermediate determinants, including access to healthcare (e.g., availability, cost, and parental awareness) and environmental conditions (e.g., housing quality and overcrowding), which have a direct relationship with developmental risk by enabling or constraining healthy growth. Most immediately, proximal factors—such as low birth weight, maternal health during pregnancy, malnutrition, and inadequate caregiving practices including poor breastfeeding and limited parental engagement—directly impact the child's development. Thus, the framework describes a pathway through which broader social and economic conditions filter through community and health system environments to influence the biological and behavioral interactions that most directly determine developmental outcomes.

### 3. Objective of the study

The purpose of this study is to identify the determinants of developmental delay among under-three year's children in Addis Ababa, Ethiopia, 2025.

## 4. Methods and materials

### 4.1 Study area and study period

The study was conducted in Addis Ababa among under three-year children starting from June 10 to August 10, 2025. Addis Ababa is the capital and largest city of Ethiopia. The City is the commercial and cultural hub of the country functioning as the seat of the African Union and the Ethiopian Federal Government. The city administration is divided into eleven sub-cities: Addis Ketema, Akaki-Kality, Arada, Bole, Gulele, Kirkos, Kolife, Lideta, Nifas Silik-Lafto, Yeka and lemikura sub-cities.

According to Ethiopian Statistical Service (ESS) the city has approximately 5,800,000 projected total population, from which 2,800,000 million males' and 3,000,000 million females' populations. In total, there are 1,350,000HHs. The population of under three children and reproductive age women are 350,000 and 800,000 respectively .In the city, there are a total of 52 governmental and Private hospitals, 101 health centers that offer primary health care service and preventive care and 1015 clinic including private health clinic and specialized care facilities, providing outpatient services based on 2024 health management information system (HMIS).

The Early Childhood Development (ECD) program is implemented in 101 health centers across Addis Ababa. Services are provided by 5000 ECD-PC professionals trained and certified to level two TVET, along with 101 supervisors who have received basic ECD training and hold first degrees in health sciences. This program emphasizes nurturing care and developmental milestone assessment for children under six years while also addressing the needs of pregnant women and lactating mothers in the community.

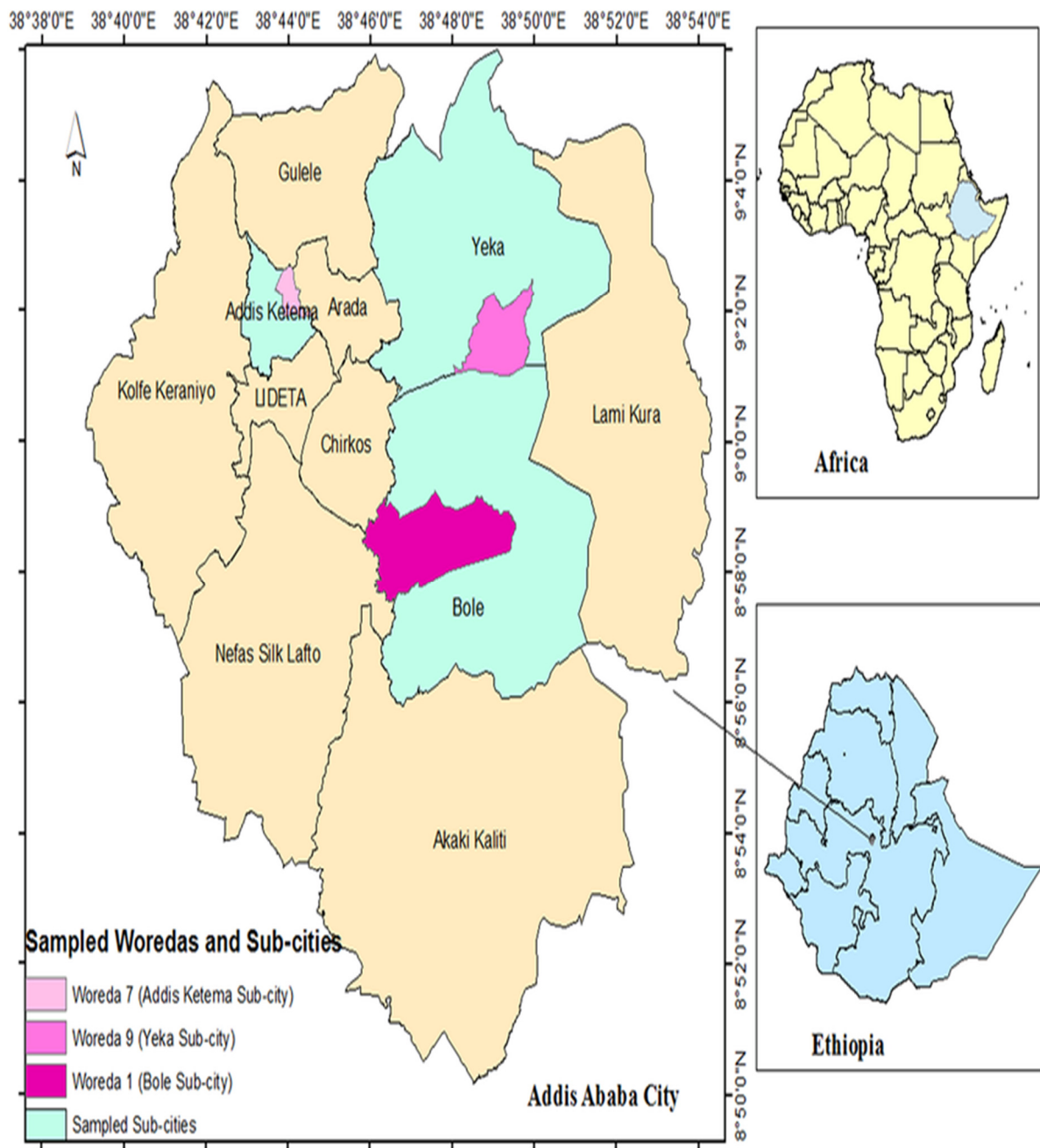


Figure 2: Location map of Addis Ababa 2025 (Source: developed by the researchgate.net using Ethio-GIS database)

## 4.2 Study design

Community based unmatched case control study was conducted.

## 4.3 Population

### ***Source of population***

Case Population: Under-three children having developmental delays residing in Addis Ababa, Ethiopia.

Control Population: Under-three children without developmental delays residing in Addis Ababa, Ethiopia.

### ***Study population***

The study population was under three year's children from randomly selected districts of Addis Ababa; under three children who had developmental delay and those who didn't have developmental delay was categorized into the case group and the control group.

## 4.4 Eligibility criteria

### ***Inclusion criteria***

#### Cases

The cases were included children under three years old identified as having developmental delays using the ASQ-3, with scores below 1.5 standard deviations from the mean. Participants must have been residents of the study district for a minimum of six months.

#### Controls

The controls were including children under three years old identified as not having developmental delays using the ASQ-3, with scores at or above 1.5 standard deviations

from the mean, and who have been residents of the study district for at least six months.

#### ***Exclusion criteria***

Mothers or caregivers who were very ill and unable to respond, or children who had resided for less than six months were excluded from the study.

#### **4.5 Sample size determination and sampling technique**

Using the statistical program EpiData Version 4.6.0, the sample size was calculated by taking into account the following assumptions: power( $\beta$ ) =80% ( $Z = 0.84$ ), CI=95%( $\alpha/2=1.96$ ) , design effect (DEFF) =2 and 1:1 cases to control ratio(r),  $p_1$  = proportion of developmental delay in low birth weight child for cases and  $p_2$  = proportion of non-developmental delay in low birth weight child in controls from a study conducted in Addis Ababa, Ethiopia which were 30% and 15% among cases and controls respectively.

#### ***Sample size formula:***

$$n = \left( \frac{Z_{\alpha/2} \sqrt{2p(1-p)} + Z_{\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}}{p_1 - p_2} \right)^2$$

**Table 1: Distribution of Developmental and Non-Developmental Cases and Controls by Variable**

| List of variables             | Proportion of developmental delay children (%) | Proportion of non-developmental children (%) | Sample size | Reference |
|-------------------------------|------------------------------------------------|----------------------------------------------|-------------|-----------|
| Low birth weight              | 30                                             | 15                                           | 268         | (21)      |
| Malnutrition                  | 52.8                                           | 28.5                                         | 142         |           |
| Limited access to health care | 40                                             | 20                                           | 182         |           |
| Infectious disease            | 60                                             | 30                                           | 98          |           |

By considering a 10% non-response rate, the final required sample size is 589 from which 295 for cases and 294 for controls from the selected districts.

### *Sampling techniques and procedures*

Samples were drawn from Addis Ababa city using multi-stage sampling. First, three sub-cities were randomly selected from the eleven sub-cities using a lottery method. Since the number of districts (woredas) varies among the sub-cities, three districts were randomly chosen from each selected sub-city, also using the lottery method.

Within each district, there are Ketenas, which consist of blocks and households. In each block, households are assigned to one Early Childhood Development (ECD) Program worker. After consulting with ECD-PC workers who provide ECD services to children under six years of age, we were reached the community. Nine well-trained enumerators were then mobilized to screen all children aged under three years, identifying those with developmental delays and those without delays using the Ages and Stages Questionnaire (ASQ-3) Tool.

Following the screening, sampling frames of cases and controls were prepared for each district. The required cases and controls were selected from these frames using a systematic random sampling technique, where every  $n$ th child was chosen after randomly selecting a starting point. Proportional allocation of the number of cases and controls was considered for participation in the study from each district. Cases and controls that meet the inclusion criteria were recruited from households within the total sample. Additionally, only one younger child was selected per household during the data collection process.

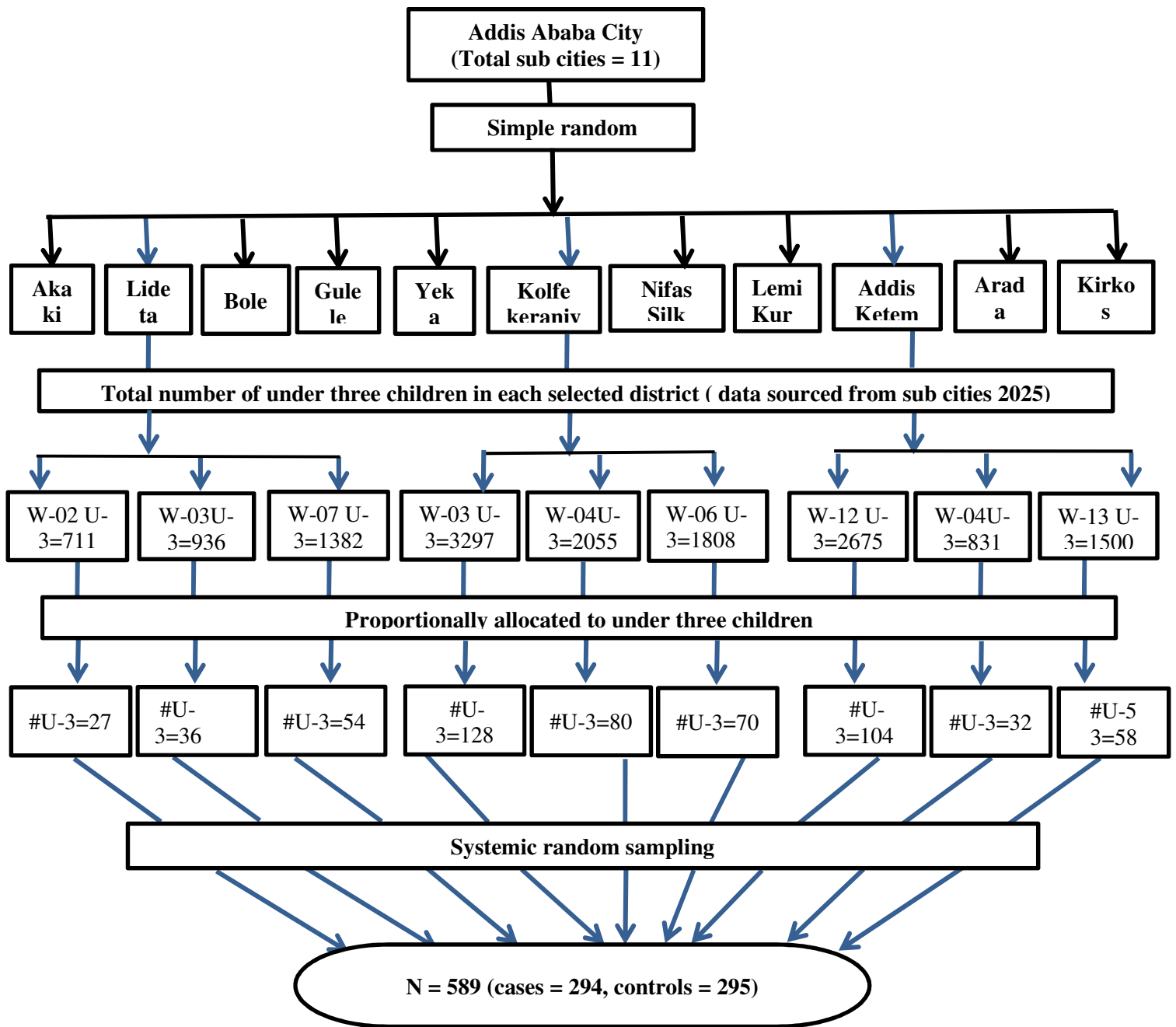


Figure 3 Diagrammatic representation sampling technique of sampling unit; 2025

## 4.6 Study variables

### ***Dependent variables***

Developmental delay among under three children.

### ***Independent variables:***

***Socio-demographic Characteristics:*** Age and sex of the child, birth order, number of under three children, size of family, family monthly income, residence, age of mothers/caregivers, occupation and education status of mothers/caregivers, and father education and occupation.

***Environmental Factors:*** Poor housing quality and overcrowding, Lack of sanitation and clean water, availability of playground and Local resources.

***Maternal, Neonatal and Child Health:*** Maternal substance abuse, Infections during pregnancy, premature birth, Low birth, Conditions such as cerebral palsy or autism spectrum disorders, Deficiencies in essential nutrients.

***Access to Healthcare and Parent Care Giving Practice:*** Number of healthcare facilities, trained healthcare professionals, costs of healthcare services, health insurance, transportation infrastructure, distances to the nearest healthcare center, waiting times and overcrowding in healthcare settings, lack of continuity in care and Insufficient referral system, Inadequate breastfeeding practices, parental engagement and interaction, access to early childhood education and developmental programs.

## 4.7 Operational definitions

***Developmental Delay:*** A child under three years is considered to have a developmental delay if they score 1.5 standard deviations below the mean or below 10th percentile in one or more developmental domains (communication, language, gross motor, fine motor and problem-solving, or personal-social) (66).

***Gross Motor Skills:*** The ability to perform large movements that involve the whole body or major muscle groups, measured by milestones such as rolling over, sitting up, crawling, and walking by age three(67).

***Fine Motor Skills:*** The ability to perform precise movements using small muscle groups, particularly in the hands and fingers, which can be measured by milestones such as the ability to grasp small objects, manipulate toys, or use utensils by age three(67).

***Socio-emotional skills:*** refer to a child's ability to recognize, understand, and manage their own emotions and the emotions of others, as well as to form positive relationships and engage in social interactions, as measured by age-appropriate developmental milestone (67).

***Cognitive skills:*** refer to the mental processes that enable a child to acquire knowledge and understanding, including attention, memory, problem-solving, reasoning, and processing speed, as measured by age-appropriate developmental milestones (67).

***Speech and language skills:*** refer to the combined abilities of a child to effectively produce and articulate sounds and words (speech skills) while also understanding and using language for communication (language skills), encompassing both expressive language (the ability to convey thoughts and feelings) and receptive language (the ability to comprehend spoken and written language), as measured by age-appropriate developmental milestones (67).

***Early Childhood Development (ECD):*** Early childhood development (ECD) is a comprehensive process that encompasses the physical, cognitive, social, and emotional growth of children from birth to age three, measured through observable milestones in areas such as language acquisition, motor skills development, social interaction, and emotional regulation, alongside the quality of care-giving and learning environments that support these developmental domains (2).

***Socioeconomic Status (SES):*** is a composite measure that includes household income levels, education attainment (particularly of the primary caregiver), occupational status (employment type and stability), and access to basic services (such as clean water, sanitation, and healthcare), which collectively influence a family's economic well-being and social standing (68).

***Malnutrition:*** A condition where a child exhibits anthropometric measurements (weight-

for-height below -2 standard deviations for wasting or height-for-age below -2 standard deviations for stunting), inadequate dietary intake (less than 70% of the recommended dietary allowance for their age)(69).

***Healthcare Access:*** Access to health care is the ability of individuals to obtain necessary medical services, evaluated through indicators such as utilization rates, availability of services, affordability, geographic accessibility, and acceptability of care (70).

#### 4.8 Data collection tool, methods and procedure

The Ages & Stages Questionnaires, Third Edition (ASQ-3), developed by Squires and Bricker, is a parent-completed developmental screening tool designed to identify delays in children aged 1 to 66 months. It is standardized on a U.S. population of over 18,000 children and is widely used in the United States and in other countries such as China, Southeast Asia, Australia, India, Europe, Central and South America, and Africa (71).

The ASQ-3 consists of 21 separate questionnaires tailored for different age intervals from 1 month to 66 months. For this research, the first 16 questionnaires will be utilized. In Ethiopia, the ASQ-3 has been adapted for cross-cultural use, demonstrating improved metrics with 85% sensitivity and 90% specificity in detecting developmental delays. The culturally adapted Amharic version has been widely used in Ethiopian research, showing strong validity through clinical correlations and feasibility in low-resource settings (). The ASQ-3 requires parents to respond to different items across five developmental domains: communication, gross motor, fine motor, problem-solving and socio-emotional skills. Responses are scored as YES = 10 SOMETIMES =5, and I NOT YET =0 with the total score for each domain calculated accordingly. Scores below the cut-off in one or more domains indicate developmental delays, while scores above the cut-off in all domains are considered normal.

In addition to the ASQ-3 structured questionnaires adapted from WHO and by carefully conducting a thorough review of relevant literature sources (73-76) was utilized. These questionnaires were organized into four sections focusing on socio-demographic, biological, healthcare access, and environmental factors. They were designed for clarity,

featuring mutually exclusive answer options, and were initially created in English. A qualified expert translated them into Amharic, with subsequent back-translation to ensure accuracy.

Data collection occurred through home visits from June to August 2025, where nine trained health professionals—comprising nine BSc nurses as data collectors and three public health officers as supervisors with the guidance of ECD-PC workers were conducted face-to-face interviews with mothers or caregivers of children using the pretested structured questionnaires. The health professionals underwent three-day training on the study's objectives, questionnaire contents, data collection methods, informed consent forms, and interviewing techniques. If a selected participant was unavailable on the initial collection day, the data collectors returned for follow-up. The overall data gathering process was supervised by the three public health officers and a principal investigator, who monitored the collection efforts daily to ensure completeness, accuracy, and consistency.

#### 4.9 Data quality control

The questionnaire was developed by reviewing various kinds of literature. After being created in English, the free, objective-based, logically designed questionnaire for scientific terminology was translated by language experts into Amharic to maintain consistency. Before the official data collection started, the questionnaire was pre-tested on 5% of the sample size to make sure that the local community could understand.

Nine data collectors and three supervisors were train for three days on the purpose of the study, the contents of the questionnaire, data collection methods, informed consent forms, and how to interview mothers/caregivers. Every day during the whole data-gathering period, the principal researcher checked for completeness, clarity, and consistency. Further, a questionnaire was reviewed for consistency and completeness before entering data and making the required correction.

#### 4.10 Data processing and analysis

To ensure data quality, data collectors and supervisor were trained. Supervisors were checking the completeness, consistency and appropriateness of the collected data every day and was completed or corrected according to the identified problems. Pre-coded and DE identified data was entered into SPSS 25. Data cleaning, organizing, transforming and summarizing was done once the data are entered into SPSS.

The data collected was entered into EpiData version 4.6.0, and then exported to SPSS Version 25 for analysis. The analysis began by applying descriptive statistics for categorical variables, reporting frequencies and percentages, while means and standard deviations were used for continuous variables. Next a bivariate logistic regression was conducted to identify the crude association between the independent variables and dependent variable. In this analysis, independent variables statistically associated at  $p < 0.25$  were selected and retained as candidate variables for the multivariable analysis. Finally, a multivariable analysis was performed to assess the relative effect of the explanatory variables on the outcome variable. The significant associations identified in this model was quantified using Adjusted Odds Ratios (AOR), along with 95% confidence intervals (CI) and a significance threshold of  $p < 0.05$ . The independent variables, which judged to have a statistically significant relationship with the outcome variable were included in the final model. The Hosmer-Lemeshow goodness of fit test was performed to check the final model's fitness. The model was fitted by the p-value of 0.187. Multi-collinearity of explanatory factors was assessed using the variance inflation factor (VIF). A VIF value of less than five was used as a cut-off value, as commonly recommended in the literature, and explanatory variables with a VIF of value less than five were included in the model. This study had an average VIF value of 1.292, indicating low multi-collinearity between the Independent variables, with a tolerance value of 0.792.

#### 4.11 Ethical considerations

Ethical approval was obtained from St. Paul's Hospital Millennium Medical College (SPHMMC) Institutional Review Board (IRB) (SPHMMC-ERC-111/25). The IRB approval and SPHMMC's support letters was submitted to Addis Ababa City Administration Health Bureau (AACAHB). The AACAHB wrote an official permission and support letter to sub-city Health offices (and the respective health centers). The data collection was started after official permission was secured from the respective Health centers.

During the data collection, the parents of the children was informed about the purpose of the study, benefits of the study, why the children are chosen, the processes of the study, their right to refuse the participation of the children from the outset or else if they do need to withdraw during the process, the confidentiality of the information and anonymous questionnaire filling. The parents also informed that there will be no penalty or denial of services for not participating in the study and no payment for participating in the study. Then after, the parents requested for informed permission to let the child participate in the study. Children classified as having developmental delays and not currently in follow-up were linked to Early Childhood Development Program (ECD-PC) workers for appropriate support and referral.

#### 4.12 Plan for dissemination of result

The results of this study will be presented to St. Paul's hospital millennium medical college, School of Public Health. It will also be distributed to the AACAHB, Sub city Administration and Health Offices, District Health centers and others who want to use it and to take action against the determinants of developmental delay in under-three children of the study in Addis Ababa. The manuscript will then be submitted to reputable journals for publication

## 5. Results

### 5.1 Socio-demographic characteristics

A Socio-demographic characteristic was conducted between the 295 cases (children with developmental delay) and 294 controls (children without developmental delay). Regarding the child's characteristics, the age distribution showed a comparable pattern between the two groups. The largest proportion of children in both the case (42.4%) and control (40.1%) groups belonged to the 24-35 months category. The 12-23 months category represented 36.9% of cases and 33.0% of controls, while the youngest age group (0-5 months) constituted smaller proportions in both groups (4.4% of cases versus 6.5% of controls). The sex distribution was nearly identical between groups, with males representing 50.2% of cases and 51.7% of controls, indicating a balanced gender representation in the study population

Family structure characteristics demonstrated some variations between groups. Birth order analysis showed that first-born children constituted 34.6% of cases and 35.4% of controls, while second-born children represented 41.7% of cases compared to 38.8% of controls. The proportion of children with a birth order of three was identical in both groups (18.0%), though families with four or more children were somewhat less represented in the case group (5.8%) compared to controls (7.8%). The number of under-three children in the family showed that families with one child under three were more common in the control group (62.9%) than in the case group (59.0%), while families with two under-three children were more prevalent among cases (30.8%) than controls (26.2%). Family size distribution revealed that nearly half of the participants in both groups came from families with fewer than four members (47.8% of cases and 50.3% of controls), though larger families (six or more members) were more common among cases (13.6%) than controls (8.8%).

Income distribution was similar between groups, with nearly half of all participants belonging to households earning less than 5,000 ETB monthly (49.5% of cases and 49.7% of controls). (However, maternal age distribution showed that younger mothers (under 20

years) were more in the control group (11.9%) than in the case group (8.1%), while mothers over 40 years were twice as common among cases (6.1%) compared to controls (3.1%).

Maternal occupational status revealed that housewives were substantially more represented in the case group (18.3%) compared to the control group (9.2%), while government employment was more common among control mothers (31.6%) than case mothers (26.4%). Educational attainment showed mothers who could not read or write were more than twice as prevalent in the case group (28.6%) compared to the control group (11.9%). Conversely, mothers with higher education were better represented in the control group (23.4%) than in the case group (13.9%). The distribution of primary and secondary education showed intermediate patterns, with case mothers having slightly higher representation in both categories compared to control mothers.

Paternal occupational patterns showed relatively similar distributions between groups, with self-employment being the dominant category for both case (71.2%) and control (68.7%) fathers. Government employment was somewhat more common among control fathers (12.9%) than case fathers (10.5%), while unemployment rates were nearly identical between groups (18.3% for cases versus 18.4% for controls).

Table 2: Socio-demographic characteristics study participants in Addis Ababa City: Ethiopia; 2025(N=589: cases=295, control=294)

| Characteristics    | Frequency |             |            |             |
|--------------------|-----------|-------------|------------|-------------|
|                    | Case No   | Percent (%) | Control No | Percent (%) |
| <b>Child's age</b> |           |             |            |             |
| 0-5                | 13        | 4.4%        | 19         | 6.5%        |
| 6-11               | 48        | 16.3%       | 60         | 20.4%       |
| 12-23              | 109       | 36.9%       | 97         | 33.0%       |
| 24-35              | 125       | 42.4%       | 118        | 40.1%       |
| <b>Child's Sex</b> |           |             |            |             |
| Female             | 147       | 49.8%       | 142        | 48.3%       |
| Male               | 148       | 50.2%       | 152        | 51.7%       |
| <b>Birth Order</b> |           |             |            |             |

|                                                     |     |       |     |       |
|-----------------------------------------------------|-----|-------|-----|-------|
| 1                                                   | 102 | 34.6% | 104 | 35.4% |
| 2                                                   | 123 | 41.7% | 114 | 38.8% |
| 3                                                   | 53  | 18.0% | 53  | 18.0% |
| 4 or more                                           | 17  | 5.8%  | 23  | 7.8%  |
| <b>Number of Under-Three Children in the Family</b> |     |       |     |       |
| 1                                                   | 174 | 59.0% | 185 | 62.9% |
| 2                                                   | 91  | 30.8% | 77  | 26.2% |
| 3 or more                                           | 30  | 10.2% | 32  | 10.9% |
| <b>Family Size</b>                                  |     |       |     |       |
| <4                                                  | 141 | 47.8% | 148 | 50.3% |
| 4-6                                                 | 114 | 38.6% | 120 | 40.8% |
| >=6                                                 | 40  | 13.6% | 26  | 8.8%  |
| <b>Family income (ETB)</b>                          |     |       |     |       |
| <5000                                               | 146 | 49.5% | 146 | 49.7% |
| 5000-9999                                           | 86  | 29.2% | 90  | 30.6% |
| 10000-19999                                         | 28  | 9.5%  | 28  | 9.5%  |
| >20000                                              | 35  | 11.9% | 30  | 10.2% |
| <b>Mother's Age</b>                                 |     |       |     |       |
| <20                                                 | 24  | 8.1%  | 35  | 11.9% |
| 20-30                                               | 151 | 51.2% | 158 | 53.7% |
| 31-40                                               | 102 | 34.6% | 92  | 31.3% |
| >40                                                 | 18  | 6.1%  | 9   | 3.1%  |
| <b>Mother occupation</b>                            |     |       |     |       |
| House wife                                          | 54  | 18.3% | 27  | 9.2%  |
| Self employed                                       | 163 | 55.3% | 174 | 59.2% |
| Government employed                                 | 78  | 26.4% | 93  | 31.6% |
| <b>Mother's education</b>                           |     |       |     |       |
| Can't read and write                                | 35  | 11.9% | 84  | 28.6% |
| Primary education                                   | 100 | 33.9% | 81  | 27.6% |
| Secondary education                                 | 91  | 30.8% | 88  | 29.9% |
| Higher education                                    | 69  | 23.4% | 41  | 13.9% |
| <b>Father's occupation</b>                          |     |       |     |       |
| Unemployed                                          | 54  | 18.3% | 54  | 18.4% |
| Self employed                                       | 210 | 71.2% | 202 | 68.7% |
| government employed                                 | 31  | 10.5% | 38  | 12.9% |

## 5.2 Environmental Characteristics

A majority of households in both groups had access to clean drinking water, though this access was slightly more among controls (93.5%) compared to cases (89.2%). Similarly, most households reported having adequate sanitation facilities, with a higher proportion in

the control group (84.4%) than in the case group (81.4%). Regarding household ventilation, 72.4% of controls lived in adequately ventilated homes, compared to 65.8% of cases.

The availability of parks or playgrounds was comparable between the two groups (52.2% for cases vs. 53.7% for controls). A substantial difference was noted in the availability of local resources for early childhood education, with 71.8% of control families reporting their availability compared to 58.3% of case families.

Table 3: Environmental characteristics of study participants in Addis Ababa City: Ethiopia; 2025(N=589: cases=295, control=294)

| Characteristics                                                | Frequency |             |            |             |
|----------------------------------------------------------------|-----------|-------------|------------|-------------|
|                                                                | Case No   | Percent (%) | Control No | Percent (%) |
| <b>Access to clean drinking water</b>                          |           |             |            |             |
| No                                                             | 32        | 10.8%       | 19         | 6.5%        |
| Yes                                                            | 263       | 89.2%       | 275        | 93.5%       |
| <b>Adequate sanitation facilities (toilet)</b>                 |           |             |            |             |
| No                                                             | 55        | 18.6%       | 46         | 15.6%       |
| Yes                                                            | 240       | 81.4%       | 248        | 84.4%       |
| <b>Home adequately ventilated</b>                              |           |             |            |             |
| No                                                             | 101       | 34.2%       | 81         | 27.6%       |
| Yes                                                            | 194       | 65.8%       | 213        | 72.4%       |
| <b>Parks or playgrounds available</b>                          |           |             |            |             |
| No                                                             | 141       | 47.8%       | 136        | 46.3%       |
| Yes                                                            | 154       | 52.2%       | 158        | 53.7%       |
| <b>Local resources available for early childhood education</b> |           |             |            |             |
| No                                                             | 123       | 41.7%       | 83         | 28.2%       |
| Yes                                                            | 172       | 58.3%       | 211        | 71.8%       |

### 5.3 Maternal, Neonatal and Child Health Characteristics

Maternal infections during pregnancy were reported for 22.0% of the case group, nearly double the rate observed in the control group (11.2%). Furthermore, premature birth was more common in children with developmental delay (26.8%) than in those without (16.0%). A substantial difference was observed in the rate of low birth weight, which affected 33.9% of cases compared to 15.3% of controls. The presence of other known medical conditions was identified in 19.0% of cases and 11.2% of controls. Finally, nutritional deficiencies were 42.0% of the children with developmental delay, which was twice the prevalence found in the control group (21.8%).

Table 4: Maternal, Neonatal and Child Health characteristics study participants in Addis Ababa City: Ethiopia; 2025(N=589: cases=295, control=294)

| Characteristics                                               | Frequency |             |            |             |
|---------------------------------------------------------------|-----------|-------------|------------|-------------|
|                                                               | Case No   | Percent (%) | Control No | Percent (%) |
| <b>Maternal Substance Abuse during Pregnancy</b>              |           |             |            |             |
| No                                                            | 272       | 92.2%       | 280        | 95.2%       |
| Yes                                                           | 23        | 7.8%        | 14         | 4.8%        |
| <b>Infections during Pregnancy</b>                            |           |             |            |             |
| No                                                            | 230       | 78.0%       | 261        | 88.8%       |
| Yes                                                           | 65        | 22.0%       | 33         | 11.2%       |
| <b>Child born prematurely</b>                                 |           |             |            |             |
| No                                                            | 216       | 73.2%       | 247        | 84.0%       |
| Yes                                                           | 79        | 26.8%       | 47         | 16.0%       |
| <b>Child born with Low Birth Weight?</b>                      |           |             |            |             |
| No                                                            | 195       | 66.1%       | 249        | 84.7%       |
| Yes                                                           | 100       | 33.9%       | 45         | 15.3%       |
| <b>Known Conditions</b>                                       |           |             |            |             |
| No                                                            | 239       | 81.0%       | 261        | 88.8%       |
| Yes                                                           | 56        | 19.0%       | 33         | 11.2%       |
| <b>Child been diagnosed with any nutritional deficiencies</b> |           |             |            |             |
| No                                                            | 171       | 58.0%       | 230        | 78.2%       |
| Yes                                                           | 124       | 42.0%       | 64         | 21.8%       |

#### 5.4 Access to health care and parent care giving practice characteristics

The distribution of the number of healthcare facilities accessible within the neighborhood was similar between the two groups, with approximately 43% of both cases and controls having access to one facility, while about 15% had access to three or more facilities.

While the majority of both groups had access to trained professionals; this was more common among controls (87.8%) than cases (81.7%). Similarly, perceptions of healthcare costs showed some variation, with a higher proportion of controls (31.3%) finding services affordable compared to cases (25.8%), while more cases (13.6%) perceived services as expensive compared to controls (10.2%).

Health insurance coverage was nearly identical between the groups, with approximately 62 %of both cases and controls having coverage .However, transportation infrastructure showed notable disparities, with controls reporting good transportation infrastructure (49.7%) more frequently than cases (41.0%), while poor infrastructure was more common among cases (11.9%) than controls (6.5%).

The distance to healthcare facilities was similarly distributed, with about 47% of cases and 45% of controls living within 1 km of a facility. Waiting times in healthcare settings were perceived as moderate by most participants in both groups(64.1% cases, 63.3% controls).The availability community support programs was slightly higher among case families (59.0%) than control families (55.8%).Finally, the availability of referral systems was comparable between groups, with approximately 64% of cases and 63% of controls reporting access to such systems.

Notable differences were observed in exclusive breastfeeding practices. A higher percentage of control children (59.0%) were exclusively breastfed for the recommended six months, compared to 49.3% of case children. Conversely, a larger proportion of case children (34.7%) were exclusively breastfed for less than six months, relative to controls (24.1%). For complementary feeding, initiating feeding before six months was slightly more common in the control group (47.3%) than in the case group (44.7%).

When examining play habits, a similar proportion of children played outside daily (38.6% cases vs. 39.5% controls). However, access to educational toys or materials was more frequent among controls (76.2%) than cases (69.2%). Parental engagement activities also showed differences; daily reading was reported for 35.7% of control children versus 29.5% of case children. Interactive play was reported daily at similar rates (43.7% cases vs. 44.9% controls).

Table 5: Access to health care and parent care giving practice characteristics of study participants in Addis Ababa City: Ethiopia; 2025(N=589: cases=295, control=294)

| Characteristic                                                             | Frequency |             |            |             |
|----------------------------------------------------------------------------|-----------|-------------|------------|-------------|
|                                                                            | Case No   | Percent (%) | Control No | Percent (%) |
| <b>Number of Healthcare Facilities Accessible within your neighborhood</b> |           |             |            |             |
| 1                                                                          | 128       | 43.4%       | 129        | 43.9%       |
| 2                                                                          | 124       | 42.0%       | 120        | 40.8%       |
| 3 or more                                                                  | 43        | 14.6%       | 45         | 15.3%       |
| <b>Presence of Trained Healthcare Professionals</b>                        |           |             |            |             |
| No                                                                         | 54        | 18.3%       | 36         | 12.2%       |
| Yes                                                                        | 241       | 81.7%       | 258        | 87.8%       |
| <b>Cost of Healthcare Services</b>                                         |           |             |            |             |
| Affordable                                                                 | 76        | 25.8%       | 92         | 31.3%       |
| Expensive                                                                  | 40        | 13.6%       | 30         | 10.2%       |
| Moderate                                                                   | 179       | 60.7%       | 172        | 58.5%       |
| <b>Health Insurance Coverage</b>                                           |           |             |            |             |
| No                                                                         | 112       | 38.0%       | 111        | 37.8%       |
| Yes                                                                        | 183       | 62.0%       | 183        | 62.2%       |
| <b>Transportation Infrastructure</b>                                       |           |             |            |             |
| Fair                                                                       | 139       | 47.1%       | 129        | 43.9%       |
| Good                                                                       | 121       | 41.0%       | 146        | 49.7%       |
| Poor                                                                       | 35        | 11.9%       | 19         | 6.5%        |
| <b>Distance to health care facilities</b>                                  |           |             |            |             |
| >5km                                                                       | 50        | 16.9%       | 49         | 16.7%       |
| 1-5km                                                                      | 105       | 35.6%       | 112        | 38.1%       |
| <1km                                                                       | 140       | 47.5%       | 133        | 45.2%       |
| <b>Waiting Times in Healthcare Settings</b>                                |           |             |            |             |
| Long                                                                       | 34        | 11.5%       | 41         | 13.9%       |
| Moderate                                                                   | 189       | 64.1%       | 186        | 63.3%       |
| Short                                                                      | 72        | 24.4%       | 67         | 22.8%       |
| <b>Referral System Availability</b>                                        |           |             |            |             |
| No                                                                         | 106       | 35.9%       | 109        | 37.1%       |

|                                                                      |     |           |     |       |
|----------------------------------------------------------------------|-----|-----------|-----|-------|
| Yes                                                                  | 189 | 64.1%     | 185 | 62.9% |
| <b>Community support programs available for parents and children</b> |     |           |     |       |
| No                                                                   | 121 | 41.0%     | 130 | 44.2% |
| Yes                                                                  | 174 | 59.0%     | 164 | 55.8% |
| <b>Exclusive breast feeding</b>                                      |     |           |     |       |
| 6 months                                                             | 145 | 49.3%     | 174 | 59.0% |
| Less than 6 months                                                   | 102 | 34.7%     | 71  | 24.1% |
| Greater than 6 months                                                | 47  | 16.0%     | 50  | 16.9% |
| <b>Complementary breast feeding</b>                                  |     |           |     |       |
| 6 months                                                             | 136 | 46.1%     | 118 | 40.1% |
| Before 6 months                                                      | 132 | 44.7%     | 139 | 47.3% |
| After six months                                                     | 27  | 9.2%      | 37  | 12.6% |
| <b>Read to your child</b>                                            |     |           |     |       |
| Daily                                                                | 87  | 29.5%     | 105 | 35.7% |
| Few times in a week                                                  | 105 | 35.6%     | 102 | 34.7% |
| Hardly ever                                                          | 34  | 11.5%     | 31  | 10.5% |
| Once or twice a month                                                | 69  | 23.4%     | 56  | 19.0% |
| <b>Child play outside</b>                                            |     |           |     |       |
| Daily                                                                | 114 | 38.6%     | 116 | 39.5% |
| Few times in a week                                                  | 91  | 30.8%     | 94  | 32.0% |
| Hardly ever                                                          | 25  | 8.5%      | 29  | 9.9%  |
| Once or twice a month                                                | 65  | 22.0%     | 55  | 18.7% |
| <b>Engagement in interactive play with your child</b>                |     |           |     |       |
| Daily                                                                | 129 | 43.7%     | 132 | 44.9% |
| Few times in a week                                                  | 105 | 35.6%     | 113 | 38.4% |
| Hardly ever                                                          | 10  | 3.4%      | 13  | 4.4%  |
| Once or twice a month                                                | 51  | 17.3%     | 36  | 12.2% |
| <b>Access to educational toys or materials</b>                       |     |           |     |       |
| No                                                                   | 91  | 91(30.8%) | 70  | 23.8% |
| Yes                                                                  | 204 | 69.2%     | 224 | 76.2% |

## 5.6 Factors associated with developmental delay

In this unmatched case control study, a various independent variables were examined to determine their impact on DD. Bivariate binary logistic regression analysis yielded insightful findings, indicating a significant association at  $P < 0.25$  between developmental delay and several variables. These include factors such as family size, maternal age, maternal

education, maternal occupation, household access to clean drinking water, home adequately ventilated, duration of exclusive breast feeding, initiation of complementary feeding access to educational toys or materials, local resources available for early childhood education, maternal substance abuse during pregnancy, infections during pregnancy, child born prematurely, child born with low birth weight, known conditions, child with any nutritional deficiencies, presence of trained healthcare professionals, cost of healthcare services and transportation infrastructure.

A multivariable binary logistic regression analysis was conducted to identify the independent determinants of developmental delay among children less than three years of age in Addis Ababa, Ethiopia. The model was adjusted for potential confounding variables using the backward likelihood ratio (LR) method. Variables with a p-value of less than 0.05 were considered statistically significant determinants.

The study revealed that several factors were independently associated with developmental delay. Family size showed a significant protective effect, as children from large families (more than six members) had 48.9% lower odds of developmental delay compared to those from small families (fewer than four members) (AOR = 0.511, 95% CI: 0.284–0.919,  $p = 0.025$ ).

Maternal education was a strong predictor of developmental outcomes. Mothers who could not read or write had 6.445 times higher odds of having a child with developmental delay compared to mothers with higher education (AOR = 6.445, 95% CI: 3.443–12.066,  $p < 0.001$ ). Similarly, mothers with secondary education also showed increased odds (AOR = 1.739, 95% CI: 1.016–2.975,  $p = 0.043$ ).

Maternal occupation was significantly associated with developmental delay, with children of housewives having 65.4% lower odds of developmental delay compared to children of government-employed mothers (AOR = 0.346, 95% CI: 0.183–0.657,  $p = 0.001$ ).

Feeding practices demonstrated that late initiation of complementary feeding (after six months) was associated with 2.028 times higher odds of developmental delay compared to timely initiation at six months (AOR = 2.028, 95% CI: 1.118–3.680,  $p = 0.020$ ).

The availability of local resources for early childhood education showed a protective effect, as children in communities with available resources had 40.4% lower odds of

developmental delay (AOR = 0.596, 95% CI: 0.400–0.888,  $p = 0.011$ ).

Several maternal, neonatal and child factors remained significant in the multivariable model. Maternal infections during pregnancy were associated with 2.220 times higher odds of developmental delay (AOR = 2.220, 95% CI: 1.301–3.790,  $p = 0.003$ ). Low birth weight increased the odds of developmental delay by 2.350 times (AOR = 2.350, 95% CI: 1.440–3.834,  $p = 0.001$ ). Nutritional deficiencies in the child or mother were associated with 2.000 times higher odds of developmental delay (AOR = 2.000, 95% CI: 1.270–3.149,  $p = 0.003$ ). Finally, healthcare access factors showed that the presence of trained healthcare professionals was protective, reducing the odds of developmental delay by 43.4% (AOR = 0.566, 95% CI: 0.338–0.948,  $p = 0.031$ ).

This study identified that larger family size, higher maternal education, being house wife, timely complementary feeding, availability of early childhood resources, absence of maternal infections during pregnancy, normal birth weight, absence of nutritional deficiencies, and presence of trained healthcare professionals were all independent protective factors against developmental delay in this population.

Table 6: Bivariate and Multivariable analysis of study of determinants of developmental delay among under three years children in Addis Ababa, Ethiopia, 2025.

| Variables                   |        | 95% C.I.for EXP(B)COR |       | Exp(B) | 95% C.I.EXP(B)AOR |       | P-Value<br>AOR |
|-----------------------------|--------|-----------------------|-------|--------|-------------------|-------|----------------|
|                             | Exp(B) | LOWER                 | ABOVE |        | LOWER             | ABOVE |                |
| Family size                 |        |                       |       |        |                   |       |                |
| <4                          | 1      |                       |       | 1      |                   |       |                |
| 4-6                         | 1.003  | 0.710                 | 1.416 | 1.003  | .675              | 1.491 | .987           |
| >6                          | 0.619  | 0.359                 | 1.068 | 0.5    | 0.28              | 0.919 | 0.025*         |
| Mother's age                |        |                       |       |        |                   |       |                |
| <20                         | 2.917  | 1.12                  | 7.572 | 1.831  | .631              | 5.312 | .265           |
| 20-30                       | 2.093  | .912                  | 4.802 | 1.428  | .558              | 3.653 | .458           |
| 31-40                       | 1.804  | .772                  | 4.213 | 1.204  | .461              | 3.150 | .704           |
| >40                         | 1      |                       |       | 1      |                   |       |                |
| Maternal educational status |        |                       |       |        |                   |       |                |

|                                                                |       |      |       |       |       |        |       |
|----------------------------------------------------------------|-------|------|-------|-------|-------|--------|-------|
| Can't read and                                                 | 4.039 | 2.32 | 7.016 | 6.445 | 3.443 | 12.066 | .000  |
| Primary education                                              | 1.363 | .839 | 2.214 | 1.699 | .980  | 2.946  | .059  |
| Secondary                                                      | 1.627 | 1.00 | 2.643 | 1.739 | 1.016 | 2.975  | .043  |
| Higher education                                               | 1     |      |       | 1     |       |        |       |
| <b>Mother's occupation</b>                                     |       |      |       |       |       |        |       |
| House wife                                                     | 0.419 | 0.2  | 0.728 | .346  | .183  | .657   | .001* |
| Self employed                                                  | 0.895 | 0.6  | 1.295 | .683  | .446  | 1.048  | .081  |
| Government                                                     | 1     |      |       | 1     |       |        |       |
| <b>Adequately ventilated</b>                                   |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | .809  | .527 | 1.244 | .953  | .591  | 1.537  | .843  |
| <b>Duration of exclusive breast feeding</b>                    |       |      |       |       |       |        |       |
| 6 months                                                       | 1     |      |       | 1     |       |        |       |
| Less than six                                                  | .580  | .399 | .844  | .704  | .455  | 1.091  | .117  |
| Greater than six                                               | .654  | .397 | 1.079 | .788  | .416  | 1.495  | .466  |
| <b>Complementary feeding initiation</b>                        |       |      |       |       |       |        |       |
| At 6 months                                                    | 1     |      |       | 1     |       |        |       |
| Before six months                                              | 1.214 | 0.8  | 1.710 | 1.038 | .676  | 1.594  | .865  |
| After six months                                               | 1.579 | 0.9  | 2.748 | 2.028 | 1.118 | 3.680  | .020* |
| <b>Are there educational toys or materials</b>                 |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | .701  | .486 | 1.009 | .799  | .505  | 1.264  | .337  |
| <b>Local resources available for early childhood education</b> |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | 0.550 | 0.3  | 0.776 | .596  | .400  | .888   | .011* |
| <b>Maternal substance abuse during pregnancy</b>               |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | 1.691 | .852 | 3.355 | .531  | .206  | 1.366  | .189  |
| <b>Infections During Pregnancy</b>                             |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | 2.235 | 1.4  | 3.523 | 2.220 | 1.301 | 3.790  | .003* |
| <b>Premature at birth(&lt;37 week)</b>                         |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | 1.922 | 1.2  | 2.881 | .846  | .466  | 1.536  | .583  |
| <b>Child born with Low Birth Weight</b>                        |       |      |       |       |       |        |       |
| No                                                             | 1     |      |       | 1     |       |        |       |
| Yes                                                            | 2.838 | 1.9  | 4.227 | 2.350 | 1.440 | 3.834  | .001* |

|                                                               |       |      |       |       |       |       |       |
|---------------------------------------------------------------|-------|------|-------|-------|-------|-------|-------|
| <b>Known medical condition</b>                                |       |      |       |       |       |       |       |
| No                                                            | 1     |      |       | 1     |       |       |       |
| Yes                                                           | 1.853 | 1.1  | 2.949 | .998  | .524  | 1.902 | .998  |
| <b>Child been diagnosed with any nutritional deficiencies</b> |       |      |       |       |       |       |       |
| No                                                            | 1     |      |       | 1     |       |       |       |
| Yes                                                           | 2.606 | 1.8  | 3.738 | 2.000 | 1.270 | 3.149 | .003* |
| <b>Presence of Trained Healthcare Professionals</b>           |       |      |       |       |       |       |       |
| No                                                            | 1     |      |       | 1     |       |       |       |
| Yes                                                           | 0.623 | 0.3  | 0.983 | .566  | .338  | .948  | .031* |
| <b>Cost of health care service</b>                            |       |      |       |       |       |       |       |
| Affordable                                                    | 1     |      |       | 1     |       |       |       |
| Moderate                                                      | .781  | .465 | 1.310 | 1.216 | .578  | 2.559 | .606  |
| Expensive                                                     | 1.260 | .871 | 1.822 | .822  | .518  | 1.302 | .403  |
| <b>Transportation infrastructure</b>                          |       |      |       |       |       |       |       |
| Fair                                                          | 1     |      |       | 1     |       |       |       |
| Good                                                          | 1.300 | .926 | 1.826 | .946  | .614  | 1.458 | .801  |
| Poor                                                          | .585  | .319 | 1.074 | .510  | .228  | 1.138 | .100  |

## 6. Discussion

This community-based unmatched case-control study identified multiple determinants of developmental delay (DD) among children under three years in Addis Ababa, Ethiopia. The findings align with the socio-ecological framework presented in the conceptual model, demonstrating that distal, intermediate, and proximal factors collectively influence early child development. The discussion contextualizes these results within existing literature and policy frameworks, highlights key public health implications, and addresses unexpected findings.

Maternal Education was as the strongest predictor of developmental delay. Children whose mothers were illiterate had 6.45 times higher adjusted odds (AOR=6.45, 95% CI: 3.44–12.07) of DD compared to children of mothers with higher education. This finding is

consistent with extensive global and national evidence. A meta-analysis by Jeong found that maternal education consistently predicts child development outcomes, primarily by affecting health-seeking behaviors, nutritional practices, and the quality of the home learning environment (17). In Ethiopia, Ali demonstrated that children of educated mothers have significantly better health and developmental outcomes due to improved childcare practices and resource utilization (45). This underscores the critical need for policies that promote girls' education and adult literacy programs for women. Ethiopia's Education Sector Development Programme and the National Literacy Campaign are foundational in this regard, but require accelerated implementation and targeted efforts to reach marginalized urban women (19, 30).

Maternal Occupation revealed an unexpected association: children of housewives had 65.4% lower odds (AOR=0.346, 95% CI: 0.183–0.657) of DD compared to children of government-employed mothers. This contrasts with studies from other settings where maternal employment is often associated with better resources (42). The finding may reflect the unique context of urban Ethiopia, where formal employment might involve long working hours, limited maternity leave, and reduced time for direct child interaction, as noted in studies on urban stressors in LMICs (26, 27). This highlights a potential gap in workplace policies and social protection for working mothers. Ethiopia's Labor Proclamation and Maternity Leave Policy provide a framework, but implementation and coverage, especially in the informal sector, need strengthening to support early childhood care (20).

Family Size showed a protective effect, with children from large families ( $\geq 6$  members) having 48.9% lower odds (AOR=0.511, 95% CI: 0.284–0.919) of DD. While some studies associate larger family size with resource dilution (42), this finding may reflect the collectivist culture in Ethiopia, where extended family members contribute to childcare and provide diverse stimulation. This consistent with findings from Daba in the Ethiopian

context (47). It suggests that policies and programs, such as the Social Protection Policy, should recognize and strengthen extended family and community support systems as assets for child development, rather than viewing large family size solely as a risk factor.

Low Birth Weight (LBW) was a significant risk factor, with affected children having 2.35 times higher odds (AOR=2.35, 95% CI: 1.44–3.83) of DD. This aligns with robust global evidence on the neurodevelopmental risks associated with LBW (14). In Ethiopia, high rates of LBW are often linked to maternal malnutrition and inadequate antenatal care. This finding directly supports the objectives of the Health Sector Transformation Plan II (HSTP II) and the National Nutrition Programme, which aim to reduce LBW through improved quality of antenatal care, maternal nutrition, and prevention of preterm birth (20). Scaling up interventions like balanced energy-protein supplementation for pregnant women is crucial.

Maternal Infections during Pregnancy increased the odds of DD by 2.22 times (AOR=2.220, 95% CI: 1.301–3.790). Infections can directly affect fetal brain development (50). This underscores the importance of routine antenatal screening and treatment, a core component of the Focused Antenatal Care (FANC) package under the HSTP II (20). Strengthening the capacity of health facilities to diagnose and manage common infections, and ensuring community-level awareness, are essential policy actions.

Nutritional Deficiencies in child doubled the odds of DD (AOR=2.000, 95% CI: 1.270–3.149). Malnutrition impairs neurodevelopment through mechanisms such as reduced myelination (9, 15). This finding strongly reinforces the goals of Ethiopia's National Food and Nutrition Policy and the Seqota Declaration for ending child under nutrition. Integrating developmental monitoring into nutrition programs, such as the Productive

Safety Net Programme (PSNP) and Community-Based Nutrition (CBN), could create synergies for improving both physical and cognitive outcomes.

Late Initiation of Complementary Feeding (after six months) was associated with 2.03 times higher odds (AOR=2.028, 95% CI: 1.118–3.680) of DD. Timely introduction of complementary foods is crucial for meeting increasing nutritional demands (55). This finding emphasizes the need to strengthen the implementation of the Infant and Young Child Feeding (IYCF) strategy within the Health Extension Programme. Community-level counseling by Health Extension Workers (HEWs) and ECD-PC workers must address misconceptions and provide practical guidance on appropriate complementary foods.

Availability of Local Early Childhood Resources was protective, reducing the odds of DD by 40.4% (AOR=0.596, 95% CI: 0.400–0.888). Access to community-based ECD programs provides critical stimulation and support (65). This validates Ethiopia's investment in the Early Childhood Development and Education Policy and Strategic Framework (ECDEPS) and the deployment of ECD-PC workers (19). The findings argue for the expansion and sustainable funding of these community resources, ensuring they are equitably accessible across all sub-cities of Addis Ababa.

Presence of Trained Healthcare Professionals reduced the odds of DD by 43.4% (AOR=0.566, 95% CI: 0.338–0.948). Skilled health workers can provide developmental screening and parental guidance (53, 57). This highlights the importance of the Human Resources for Health (HRH) strategic plan under HSTP II, which focuses on training, deployment, and retention of skilled personnel (20). Specifically, training frontline health workers (HEWs, nurses, midwives) in developmental surveillance should be prioritized.

The findings are largely consistent with prior research in LMICs and reinforce the rationale for existing Ethiopian policies. The strong link between maternal education and child development is a cornerstone of the Sustainable Development Goals (SDG 4) and Ethiopia's Education for All commitments (30). The associations between biological risks and DD underscore the importance of integrated service delivery as envisioned in the Health Sector Transformation Plan II and the One Health approach (20). The protective role of community resources aligns perfectly with the Nurturing Care Framework, adopted by the WHO, UNICEF, and World Bank, and operationalized in Ethiopia through the ECDEPS (12, 19).

However, some findings, such as the increased risk associated with maternal government employment, contrast with reports from high-income countries and warrant contextual interpretation. This suggests that urbanization policies and labor market regulations need to be intentionally reviewed for their impact on family life and child wellbeing, ensuring they support rather than hinder nurturing care (7, 26).

### 6.1 Strengths and Limitations of the Study

This study has several notable strengths. First, the use of a community-based, unmatched case-control design allowed for the efficient investigation of multiple determinants of developmental delay, which would be more challenging in a cross-sectional study. Second, the sample size was robust (N=589), providing adequate statistical power to identify significant associations.

However, the findings of this study should be interpreted in light of its limitations. The case-control design is inherently susceptible to recall bias, as mothers of children with developmental delays may recall past exposures. While we sought to minimize this through trained data collectors, it cannot be entirely ruled out. The study was conducted in an urban setting, and therefore, the results may not be generalizable to rural populations where the determinants and their prevalence might differ significantly.

## 7. Conclusion and Recommendation

### 7.1 Conclusion

This study identified key determinants of developmental delay among under-three children in Addis Ababa, Ethiopia. The findings conclusively demonstrate that the problem is not driven by a single cause but by a cascade of interrelated factors. Low maternal education, adverse biological conditions like maternal infection during pregnancy, low birth weight, and nutritional deficiencies, along with suboptimal feeding practices, significantly increase the risk of delay. Conversely, protective factors include larger family size (in this specific context), the presence of trained health professionals, and the availability of local early childhood development resources. The study validates the socio-ecological model presented in the study, confirming that determinants at the distal (e.g., maternal education), intermediate (e.g., healthcare access), and proximal (e.g., birth weight, nutrition) levels all contribute independently to a child's developmental outcomes. This research fills a critical gap by providing evidence from an urban Ethiopian setting, thereby answering the call for context-specific understanding raised in the problem statement.

### 7.2 Recommendations

Based on the findings of this study, the following recommendations are proposed:

For Policy Makers (Federal Ministry of Health, Addis Ababa City Administration Health Bureau):

- **Strengthen Female Education:** Intensify policies and programs aimed at keeping girls in school and promoting adult literacy for women, as maternal education is one of the most powerful leverage points for improving child development.
- **Scale up ECD Programs:** Expand the reach and quality of the existing Early Childhood Development (ECD) program by investing in more ECD-PC workers and ensuring every sub-city has accessible, well-resourced early childhood stimulation centers.

- **Enhance Prenatal and Postnatal Care:** Reinforce public health campaigns and services focused on preventing maternal infections during pregnancy, improving maternal nutrition, and reducing the incidence of low birth weight through quality antenatal care.

**For Healthcare Providers and Planners:**

- **Integrate Developmental Screening:** Routinely integrate the use of validated tools like the ASQ-3 into well-baby clinics and vaccination programs at health centers to enable early identification of developmental delays.
- **Community Health Education:** Train health extension workers and ECD-PC workers to conduct community education sessions for parents and caregivers on the importance of timely complementary feeding, recognizing developmental milestones, and creating a stimulating home environment.
- **Targeted Support for High-Risk Families:** Develop targeted intervention programs for children identified with biological risk factors (e.g., low birth weight) or those born to mothers with low educational attainment.

**For Future Research:**

- **Qualitative Exploration:** Conduct qualitative studies to better understand the unexpected protective effect of larger family size and the association between government employment and higher risk of delay, exploring themes of childcare practices, social support, and work-life balance.
- **Longitudinal Studies:** Implement longitudinal studies to track the developmental trajectories of children from infancy to school age, which would provide stronger evidence for causal relationships.
- **Intervention Research:** Design and evaluate the effectiveness of specific interventions, such as home-visiting programs by ECD workers for high-risk families, to provide evidence for scalable public health strategies.

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## 9. ANNEXES

### 8.1 English Version Informed Voluntary Consent Form for mothers/caregivers

Greetings! My name is\_\_\_\_\_. I'm assigned to collect data for the study being conducted in this community by Mr. Biniyam Leul, who is conducting the study for his Master's Degree at SPHMMC, College of Health and Medical Science, School of Public Health. I kindly request you to lend me your attention to explain about the study and being selected as the study participant.

**Title of the Study:** The study conducting on “determinants of developmental delay among under three years children in Addis Ababa, Ethiopia.

**Purpose of the study:** The finding of this study can be of paramount importance for the city Health bureau to design relevant strategies and plan an intervention activity to prevent determinants of developmental delay among under three children which helps to improve community health in general. Furthermore, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's degree program in Epidemiology the principal investigator.

**Procedure and duration:** I will interview you using a questionnaire to provide me with relevant data that is helpful for the study. Totally the interview will take not more than 30 minutes for each participant. So, I kindly request you to spare me this time for the interview.

**Risks and benefits:** Participating in this study poses minimal risk and will only take a few minutes of your time. Please note that there will not be any direct payment for your participation. However, the findings from this research have the potential to reveal important information for local health planners. Your contribution is greatly appreciated.

**Confidentiality:** The information that you provide us will be kept strictly confidential.

There will be no information that will identify you in particular. The findings of the study will be general for the study community and will not reflect anything particular about individual persons or households. The questionnaire will be coded to exclude showing the names. No referral will be made in oral or written reports that could link participants to the research.

**Rights:** Participation in this study is completely voluntary. Participants have the right to declare whether or not to participate in this study. If they decide to participate, they have the right to withdraw from the study at any time and this will not label them for any loss of benefits to which they otherwise are entitled. You are not obligated to answer any questions they are uncomfortable with.

**Contact Address:** If there are any questions or inquiries at any time about the study or procedures, Consent (Verbal Consent): please contact, the principal investigator through Mobile phone: +251-940247890/949544631 or email - leulbiniyam51@gmail.com Addis Ababa, Ethiopia. Having given all the above information.

**Declaration of informed voluntary consent:** I have read /was read to me the participant information sheet. I have clearly understood the purpose of research, the procedures, the risks and benefits, the issue of confidentiality, the rights of participating, and the contact address for any queries. I have been allowed to ask questions about things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I don't want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature).

Name and signature of participant\_\_\_\_\_ Date\_\_\_\_\_

Name and signature of data collector\_\_\_\_\_ Date \_\_\_\_\_

**በአማርኛ ለእናቶች/እንክብካቤ ሰጪዎች የተዘጋጀ በፈቃደኝነት የሚሞላ መጠይቅ**

ሰላምታ! ስሜ \_\_\_\_\_ ነው። በዚህ ማህበረሰብ ውስጥ በሚካሄደው ጥናት ላይ መረጃ ሰብሳቢ ሆኜ ተሰማርቻለሁ። ይህን ጥናት የሚካሄደው የህብረተሰብ ጤና የሁለተኛ ዲግሪ ተማሪ በሆኑት አቶ ቢንያም ልኡል ሲሆን፤ ይህ ጥናት በቅ/ጳ/ሚ/ሜ ኮሌጅ፤ የህብረተሰብ ጤና ትምህርት ቤት የሚካሄድ ነው። እባክዎን የጥናቱን ሀሳብ ለመረዳት እና እንደ ጥናት ተሳታፊ ለመምረጥ ትኩረትዎን እና ፈቃደኝነትዎን እየጠየቅኩ ነው።

**የጥናቱ ርዕስ:** Determinants of Developmental Delay Among Under-Three Years Children in Addis Ababa, Ethiopia 2024/25

**የጥናቱ ዓላማ:** የዚህ ጥናት ውጤቶች ለከተማዋ ጤና ቢሮ ተገቢ ግብአቶችን እና የበታች ልጆች እድገትን የሚያበላሹ ምክንያቶችን ለመከላከል የሚያስችሉ እቅዶችን ለመገንባት እጅግ ጠቃሚ ሊሆኑ ይችላሉ። በተጨማሪም፤ ይህ ጥናት በ ማህበረሰብ ጤና በኢፒዴሚዮሎጂ ማስተርስ ዲግሪ ፕሮግራም አካል ሆኖ የሚፃፍ የምረቃ ሥራ ነው።

**ሂደት እና ጊዜ:**

እኔ ከእርስዎ ጋር በጥያቄ አሰራር በመጠየቅ ለጥናቱ ጠቃሚ የሆነ መረጃ እሰበስባለሁ። ቃለ መጠይቁ ለእያንዳንዱ ተሳታፊ ከ30 ደቂቃዎች በላይ አይወስድም። ስለዚህ ለዚህ ቃለ መጠይቅ ጊዜዎን እንድትወስዱ እጠይቃለሁ።

**አደጋዎች እና ጥቅሞች:**

በዚህ ጥናት ውስጥ መሳተፍ ጉዳቱ በጣም አነስተኛ ነው። የእርስዎን ጊዜ ትንሽ ክፍል ብቻ ይወስዳል። ለመሳተፍዎ ቀጥተኛ ክፍያ አይሰጥዎትም። ነገር ግን፤ የጥናቱ ውጤቶች ለአካባቢያዊ ጤና እቅድ አውጪዎች ጠቃሚ መረጃ ሊያቀርቡ ይችላሉ። አስተዋጽኦዎ በጣም ይገመታል!

**ሚስጢራዊነት:**

የምትሰጡት መረጃ በጥብቅ ሚስጢር ይጠበቃል። ስምዎ፤ አድራሻዎ፤ ወይም ማንነትዎ በጥናቱ ውስጥ እንደማይገለጽ ያረጋግጣል። መረጃዎች በደህንነት የተጠበቀ መንገድ ይከማቻል።

**መብቶች:**

በዚህ ጥናት ውስጥ መሳተፍ ሙሉ በሙሉ ፈቃደኛ ነው። የመሳተፍ ወይም መተው መብት አለዎት። የማትፈልጉትን ጥያቄ ለመመለስ አለመፈለግዎን ማሳወቅ ይችላሉ።

**ለተጨማሪ መረጃ:**

የጥናቱ አስኪያጅ፡- ቢንያም ልኡል

ስልክ፡- +251-940247890 / 949544631

ኢሜይል፡- leulbiniyam51@gmail.com

አድራሻ፡- አዲስ አበባ፣ ኢትዮጵያ

ከ ተሳታፊው የተገኘ የ በጎ ፈቃደኝነት ቃል (declaration of informed voluntary consent)

የተሳታፊውን መረጃ ወረቀት አንብቤያለሁ/ተነበልኩልኝ።

የጥናቱን ዓላማ፣ ሂደት፣ አደጋዎች፣ ጥቅሞች፣ ሚስጢርነት፣ እና መብቶቼን በሙሉ ተረድቻለሁ።

ያልተገባኝ ነገር ላይ ጥያቄ ለመጠየቅ ተፈቅዶልኛል።

በማንኛውም ጊዜ ቋሜን ለመቀየር ወይም ጥያቄዎችን ለመመለስ እንደሚፈልገው መብቴ እንደሆነ ተነግሮኛል።

ስለዚህ፣ በዚህ ጥናት ውስጥ ፈቃደኛ እንደሆንኩ በፊርማዬ/የፅሁፍ ምልክቴ (\_\_\_\_\_) አረጋግጣለሁ።

የተሳታፊ ፊርማ\_\_\_\_\_

ቀን \_\_\_\_\_

የመረጃ ሰብሳቢ ፊርማ\_\_\_\_\_

ቀን \_\_\_\_\_

**ማሳሰቢያ፡** ይህ ፎርም በኢትዮጵያ የምርምር ስነምግባር መመሪያዎች መሰረት ተዘጋጅቷል።

ማሳሰቢያዎች

1፤ይህ መጠይቅ በአዲስ አበባ የሚኖሩ የሶስት ዓመት በታች ልጆች የእድገት ችግሮችን ለመመርመር የተዘጋጀ ነው።

2፤መልሶች በትክክል እና በትእግስት ይሞሉ።

3፤ሁሉም መረጃዎች በምስጢር ይጠበቃሉ።

## 8.2 Questionnaire

The questionnaire to assess the Determinants of Developmental Delay among under Three years Children in Addis Ababa, Ethiopia.

### Section 1: Socio-Demographic Characteristics

| S.N. | Questions                                    | Response                                                                                                                                                                             |
|------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Child's age                                  | _____ months                                                                                                                                                                         |
| 2    | Child's Sex                                  | <input type="checkbox"/> Male<br><input type="checkbox"/> Female                                                                                                                     |
| 3    | Birth Order                                  | <input type="checkbox"/> 1 <sup>st</sup><br><input type="checkbox"/> 2 <sup>nd</sup><br><input type="checkbox"/> 3 <sup>rd</sup><br><input type="checkbox"/> 4 <sup>th</sup> or more |
| 4    | Number of Under-Three Children in the Family | <input type="checkbox"/> 1<br><input type="checkbox"/> 2<br><input type="checkbox"/> 3 or more                                                                                       |
| 5    | Family Size                                  | <input type="checkbox"/> < 4 members<br><input type="checkbox"/> 4 - 6 members<br><input type="checkbox"/> 6 or more members                                                         |
| 6    | Family Monthly Income (ETB)                  | <input type="checkbox"/> < 5000<br><input type="checkbox"/> 5000- 9999<br><input type="checkbox"/> 10000 - 19999                                                                     |

|    |                           |                                                                                                                                                                                          |
|----|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                           | <input type="checkbox"/> 20000 or more                                                                                                                                                   |
| 7  | Mother's Age              | <input type="checkbox"/> < 20<br><input type="checkbox"/> 20 - 30<br><input type="checkbox"/> 31 - 40<br><input type="checkbox"/> > 40                                                   |
| 8  | Mother's Occupation       | <input type="checkbox"/> House wife<br><input type="checkbox"/> Self employed<br><input type="checkbox"/> Employed (formal)                                                              |
| 9  | Mother's Education Status | <input type="checkbox"/> Can't read and write<br><input type="checkbox"/> Primary education<br><input type="checkbox"/> Secondary education<br><input type="checkbox"/> Higher education |
| 10 | Father's Education Status | <input type="checkbox"/> Can't read and write<br><input type="checkbox"/> Primary education<br><input type="checkbox"/> Secondary education<br><input type="checkbox"/> Higher education |
| 11 | Father's Occupation       | <input type="checkbox"/> Unemployed<br><input type="checkbox"/> Self employed<br><input type="checkbox"/> Employed (formal)                                                              |

## Section 2: Environmental Factors

| S.N. | Questions                               | Response                                                    |
|------|-----------------------------------------|-------------------------------------------------------------|
| 12   | Access to clean drinking water          | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 13   | Adequate sanitation facilities (toilet) | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |

|    |                                                                   |                                                             |
|----|-------------------------------------------------------------------|-------------------------------------------------------------|
| 14 | home adequately ventilated                                        | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 15 | Parks or playgrounds available                                    | <input type="checkbox"/> No<br><input type="checkbox"/> yes |
| 16 | Are there local resources available for early childhood education | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |

### 3: Maternal, Neonatal and child Factors

|    |                                                 |                                                             |
|----|-------------------------------------------------|-------------------------------------------------------------|
| 17 | Maternal Substance Abuse During Pregnancy       | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 18 | Infections During Pregnancy                     | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 19 | Premature Birth                                 | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 20 | Low Birth Weight                                | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 21 | Known Conditions (e.g., cerebral palsy, autism) | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |
| 22 | Nutritional Deficiencies in Child               | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |

### Section 4: Access to Healthcare and parent Care giving practice Factors

|    |                                            |                                                                                                |
|----|--------------------------------------------|------------------------------------------------------------------------------------------------|
| 23 | Number of Healthcare Facilities Accessible | <input type="checkbox"/> 1<br><input type="checkbox"/> 2<br><input type="checkbox"/> 3 or more |
|----|--------------------------------------------|------------------------------------------------------------------------------------------------|

|    |                                              |                                                                                                                                        |
|----|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 24 | Presence of Trained Healthcare Professionals | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                            |
| 25 | Cost of Healthcare Services                  | <input type="checkbox"/> Affordable<br><input type="checkbox"/> Moderate<br><input type="checkbox"/> Expensive                         |
| 26 | Health Insurance Coverage                    | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                            |
| 27 | Transportation Infrastructure                | <input type="checkbox"/> Good<br><input type="checkbox"/> Fair<br><input type="checkbox"/> Poor                                        |
| 28 | Distance to Nearest Healthcare Center        | <input type="checkbox"/> <1<br><input type="checkbox"/> 1 - 5<br><input type="checkbox"/> >5                                           |
| 29 | Waiting Times in Healthcare Settings         | <input type="checkbox"/> Short<br><input type="checkbox"/> Moderate<br><input type="checkbox"/> Long                                   |
| 30 | Referral System Availability                 | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                            |
| 31 | Duration of exclusive breast feeding         | <input type="checkbox"/> 6 months<br><input type="checkbox"/> less than six months<br><input type="checkbox"/> Greater than six months |
| 32 | Complementary breast feeding                 | <input type="checkbox"/> at 6 months<br><input type="checkbox"/> before six months<br><input type="checkbox"/> after six months        |
| 33 | How often does the child play outside        | <input type="checkbox"/> Daily<br><input type="checkbox"/> Few times in a week                                                         |

|    |                                                                         |                                                                                                                                                                          |
|----|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                                                         | <input type="checkbox"/> Hardly ever<br><input type="checkbox"/> Once or twice a month                                                                                   |
| 34 | Does the child have access to educational toys or materials             | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                                                              |
| 35 | How often do you read to your child                                     | <input type="checkbox"/> Daily<br><input type="checkbox"/> Few times in a week<br><input type="checkbox"/> Hardly ever<br><input type="checkbox"/> Once or twice a month |
| 35 | How often do you engage in interactive play with your child?            | <input type="checkbox"/> Daily<br><input type="checkbox"/> Few times in a week<br><input type="checkbox"/> Hardly ever<br><input type="checkbox"/> Once or twice a month |
| 36 | Are there community support programs available for parents and children | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                                                              |

### መጠይቅ በ አማርኛ

የሶስት ዓመት በታች ልጆች ውስጥ የእድገት መዘግየትን የሚወስኑ ምክንያቶችን ለመገምገም የተዘጋጀ  
(አዲስ አበባ፣ ኢትዮጵያ)

ክፍል 1፡ የማህበራዊ-የሕዝብ ባህሪዎች (Socio-Demographic Characteristics)

| ተ.ቁ. | ጥያቄ | መልስ |
|------|-----|-----|
|------|-----|-----|

|    |                                   |                                                                                                                                                                                  |
|----|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | የልጁ ዕድሜ                           | _____ ወር                                                                                                                                                                         |
| 2  | የልጁ ጾታ                            | <input type="checkbox"/> ወንድ<br><input type="checkbox"/> ሴት                                                                                                                      |
| 3  | የትውልድ ቅደም ተከተል                    | <input type="checkbox"/> 1 <sup>ኛ</sup><br><input type="checkbox"/> 2 <sup>ኛ</sup><br><input type="checkbox"/> 3 <sup>ኛ</sup><br><input type="checkbox"/> 4 <sup>ኛ</sup> ወይም በላይ |
| 4  | በቤተሰቡ ውስጥ ያሉ ከሶስት ዓመት በታች ልጆች ብዛት | <input type="checkbox"/> 1<br><input type="checkbox"/> 2<br><input type="checkbox"/> 3 ወይም በላይ                                                                                   |
| 5  | የቤተሰብ መጠን                         | <input type="checkbox"/> 2 - 4 አባላት<br><input type="checkbox"/> 4 - 6 አባላት<br><input type="checkbox"/> 6 ወይም ከዛ በላይ አባላት                                                         |
| 6  | የቤተሰብ ወርሃዊ ገቢ (ብር)                | <input type="checkbox"/> < 5000<br><input type="checkbox"/> 5000 - 9999<br><input type="checkbox"/> 10000 - 19999<br><input type="checkbox"/> 20000 ወይም በላይ                      |
| 7  | የእናት ዕድሜ                          | <input type="checkbox"/> < 20<br><input type="checkbox"/> 20 - 30<br><input type="checkbox"/> 31 - 40<br><input type="checkbox"/> > 40                                           |
| 8  | የእናት ሥራ                           | <input type="checkbox"/> የቤት አመቤት<br><input type="checkbox"/> የግል ሥራ<br><input type="checkbox"/> ተቀጣሪ                                                                            |
| 9  | የእናት ትምህርት ደረጃ                    | <input type="checkbox"/> መፃፍ እና ማንበብ ማትችል<br><input type="checkbox"/> የመጀመሪያ ደረጃ<br><input type="checkbox"/> ሁለተኛ ደረጃ<br><input type="checkbox"/> ከፍተኛ ትምህርት                     |
| 10 | የአባት ትምህርት ደረጃ                    | <input type="checkbox"/> መፃፍ እና ማንበብ ማይችል<br><input type="checkbox"/> የመጀመሪያ ደረጃ<br><input type="checkbox"/> ሁለተኛ ደረጃ                                                            |

|    |         |                                                                                                    |
|----|---------|----------------------------------------------------------------------------------------------------|
|    |         | <input type="checkbox"/> ከፍተኛ ትምህርት                                                                |
| 11 | የአባት ሥራ | <input type="checkbox"/> ሥራ አልባ<br><input type="checkbox"/> ግል ሥራ<br><input type="checkbox"/> ተቀጣሪ |

ክፍል 2፡ የአካባቢ ሁኔታዎች (Environmental Factors)

| ተ.ቁ. | ጥያቄ                            | መልስ                                                        |
|------|--------------------------------|------------------------------------------------------------|
| 12   | ንጹህ የመጠጥ ውሃ የማግኘት ዕድል          | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 13   | በቂ የንፅህና መጠበቂያ ስፍራዎች (መጻዳጃ ቤት) | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 14   | ቤት በበቂ ሁኔታ አየር መግባቱ            | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 15   | መናፈሻዎች ወይም የልጆች መጫወቻ ስፍራዎች አሉ? | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 16   | ለቅድመ ልጅነት ትምህርት የአካባቢ ሀብቶች አሉ  | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |

ክፍል 3፡ ስነ-ሕዋሳዊ ምክንያቶች (Biological Factors)

|    |                                          |                                                            |
|----|------------------------------------------|------------------------------------------------------------|
| 17 | በእርግዝና ወቅት የእናት የተለያዩ ጤና ሚኒስቴር ሰቶችን መጠቀም | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 18 | በእርግዝና ወቅት ኢንፌክሽን                        | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 19 | ካለ ጊዜው ቀድሞ የተወለደ                         | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 20 | ዝቅተኛ የልደት ክብደት                           | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
| 21 | ሌሎች የጤና ችግሮች (ለምሳሌ ሴረብራል ፓልሲ፣ አቲዝም ወዘተ)  | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |

|    |                          |                                                            |
|----|--------------------------|------------------------------------------------------------|
| 22 | ልጅ ውስጥ የምግብ ንጥረነገሮች እጥረት | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ |
|----|--------------------------|------------------------------------------------------------|

ክፍል 4፡ የጤና አገልግሎት መዳረሻ (Access to Healthcare)

|    |                             |                                                                                                                |
|----|-----------------------------|----------------------------------------------------------------------------------------------------------------|
| 23 | የአቅራቢያ ያሉ የጤና ተቋማት ብዛት      | <input type="checkbox"/> 1<br><input type="checkbox"/> 2<br><input type="checkbox"/> 3 ወይም በላይ                 |
| 24 | የሰለጠኑ የጤና ባለሙያዎች መኖር        | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ                                                     |
| 25 | የጤና አገልግሎት ወጪ               | <input type="checkbox"/> ተመጣጣኝ<br><input type="checkbox"/> መካከለኛ<br><input type="checkbox"/> ውድ                |
| 26 | የጤና መድን ሽፋን                 | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ                                                     |
| 27 | የትራንስፖርት መዋቅር               | <input type="checkbox"/> ጥሩ<br><input type="checkbox"/> መካከለኛ<br><input type="checkbox"/> ደካማ                  |
| 28 | ከቅርብ የጤና ማዕከል ያለው ርቀት(በኪ.ሜ) | <input type="checkbox"/> <1<br><input type="checkbox"/> 1 - 5<br><input type="checkbox"/> >5                   |
| 29 | በጤና ተቋማት ውስጥ የሚቆዩበት ጊዜ      | <input type="checkbox"/> አጭር<br><input type="checkbox"/> መካከለኛ<br><input type="checkbox"/> ረጅም                 |
| 30 | የሪፈራል ስርዓት መኖር              | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ                                                     |
| 31 | ለስንት ጊዜ ጡት ብቻ ጠብታለች/ጠብቷል?   | <input type="checkbox"/> ለ 6 ወር<br><input type="checkbox"/> ከ 6 ወር ያነሰ<br><input type="checkbox"/> ከ 6 ወር የበለጠ |

|    |                                                |                                                                                                                                                           |
|----|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32 | ከጡት በተጨማሪ ምግብ የጀመረበት/ችበት ጊዜ                    | <input type="checkbox"/> 6 ወር ላይ<br><input type="checkbox"/> ከ 6 ወር በፊት<br><input type="checkbox"/> ከ 6 ወር በኋላ                                            |
| 33 | መናፈሻዎች ወይም የልጆች መጫወቻ ስፍራዎች አሉ?                 | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ                                                                                                |
| 34 | ህጻኑ/ቷ ትምህርታዊ መጫወቻዎች ወይም ቁሳቁሶች ማግኘት ይችላል/ትችላለች? | <input type="checkbox"/> አዎ<br><input type="checkbox"/> አይ                                                                                                |
| 35 | ለልጅዎ/ሽ ምን ያህል ጊዜ ያነበሉታል/ያነበላታል?                | <input type="checkbox"/> ቀን በቀን<br><input type="checkbox"/> በሳምንት ጥቂት ቀናቶች<br><input type="checkbox"/> በፍፁም<br><input type="checkbox"/> በወር አንዴ ወይ ሁለት ጊዜ |
| 36 | ከልጅዎ/ሽ ጋር ተገናኝተው ጨዋታዎች ምን ያህል ጊዜ ይጫወታሉ?        | <input type="checkbox"/> ቀን በቀን<br><input type="checkbox"/> በሳምንት ጥቂት ቀናቶች<br><input type="checkbox"/> በፍፁም<br><input type="checkbox"/> በወር አንዴ ወይ ሁለት ጊዜ |

#### ማሳሰቢያዎች

1. ይህ መጠይቅ በአዲስ አበባ የሚኖሩ የሶስት ዓመት በታች ልጆች የእድገት ችግሮችን ለመመርመር የተዘጋጀ ነው።
2. መልሶች በትክክል እና በትእግስት ይሞሉ።
3. ሁሉም መረጃዎች በምስጢር ይጠበቃሉ።

## DECLARATION

I, the undersigned, declare that the thesis comprises my own work. In compliance with internationally accepted practices, I have acknowledged and refereed all materials used in this work. I understand that non-adherence to the principles of academic honesty and integrity, misrepresentation/ fabrication of any idea/data/fact/source will constitute sufficient ground for disciplinary action by the college and can also evoke penal action from the sources which have not been properly cited or acknowledged.

Name of the student: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Approval of the Primary Advisor

Name of the primary advisor: Fawdie Adenaw

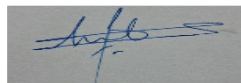
Signature: \_\_\_\_\_

Date: 24/10/2025

## Approval of the Co-Advisor

Name of the co-advisor: Abraham Getachew

Signature: \_\_\_\_\_



Date: Dec 12/2025

